Chapter 4

Mobility and Access to Transportation

Introduction

Transportation exists to help people and businesses overcome the distance between places (e.g., work and home, factory and store, store and home). Two concepts, mobility and accessibility, are most often used to measure the success of the transportation system. Mobility measurements focus on how far people and goods travel. Accessibility is a measure of the relative ease with which people and businesses can reach a variety of locations. Mobility and access are often positively related, but not always. For instance, less travel (lower mobility) might be the result of better access in cases where opportunities are located nearby. Many factors affect mobility and access, including the availability and cost of transportation and the infrastructure in place to facilitate it, population growth and economic fluctuations, and the knowledge of and ability to apply logistical options (particularly for businesses).

Both passenger travel and goods movement continue to increase in the United States, despite some signs of strain in the transportation system. About 4.6 trillion passenger-miles of travel were supported by the system in 1999, an annual increase of 2.2 percent since 1990. In addition, there were over 3.8 trillion ton-miles of domestic freight shipped in 1999, representing an annual growth rate of 2.0 percent since 1990.

Increases in population, numbers of workers, vehicle availability, and disposable personal income are among the factors that contribute to passenger travel growth. This growth can also be seen in international travel. Between 1989 and 1999 the number of U.S. residents traveling out of the country rose 44 percent. Growth is also evident when measured by mode, with increases in enplanements at large air traffic hubs, capacity in the North American cruise industry, and fast-ferry traffic.

Highway passenger travel continues to grow, with travel in light trucks posting the largest increases. The light truck share of passenger-miles of travel grew from 14 percent in 1975 to 31 percent in 1999. Despite some gains for the transit mode, the number of people driving to work alone continued its upward trend along with the distance traveled. Accessibility measures show growth, as well: the number of household vehicles, for instance, has risen to equal the number of licensed drivers. Nevertheless, there were 8 million households without a car in 1995. Access to intercity public transportation is also very high, with about 95 percent of the U.S. population now living within a reasonable distance of commercial air service, intercity bus, or Amtrak.

Congestion on the highways and in the skies slows traffic and creates a drag on the nation's economic productivity. On the highways, hours of

delay per driver almost tripled between 1982 and 1997, with drivers in the largest metropolitan areas suffering from the worst congestion. Each driver in the largest metropolitan areas lost an average of 54 hours in 1997. Flight delays tend to vary from year to year making comparisons difficult; in 2000, one in four flights by major U.S. air carriers were delayed, canceled, or diverted. Causes of congestion in the air and on the highways show some similarities: system capacity that is not keeping pace with increasing volumes and delays caused by inclement weather. Because data are not regularly collected for waterborne transportation, measures of the extent of congestion for this mode are not available.

Economic activity is a key factor affecting freight movement. So, too, are changes in business logistics, such as the location of distribution centers at greater distances from consumers and the wide use of just-in-time manufacturing. Air carrier and intercity trucking ton-miles are increasing at a faster rate than the other modes, while water ton-miles have decreased since 1980, due to a decline in Alaskan crude oil shipments. The value of air freight stood at $229 billion in 1997, up from $151 billion in 1993 (in 1997 dollars). Compared with other freight modes, air was used more often to move higher value commodities over longer distances. Despite the rapid growth of goods movement by air, however, most freight (measured in tons) was moved by trucks.

The heavier commodities—coal, gravel and crushed stones, gasoline, limestone and chalk, and fuel oils—accounted for the most tonnage shipped domestically in 1997. Measured by value, the top commodities shipped were motor vehicle parts and accessories, miscellaneous manufactured products, computer equipment, mixed freight, and pharmaceutical products. The U.S. transportation system also moved—mostly by truck—more than 1.5 billion tons of hazardous materials in 1997.

U.S. international waterborne container trade increased throughout the 1990s. In general, however, demand for U.S. exports has not kept pace with consumer demands for imports. This imbalance increases shipping costs because of the need to reposition empty containers or store them indefinitely on U.S. port facility property.

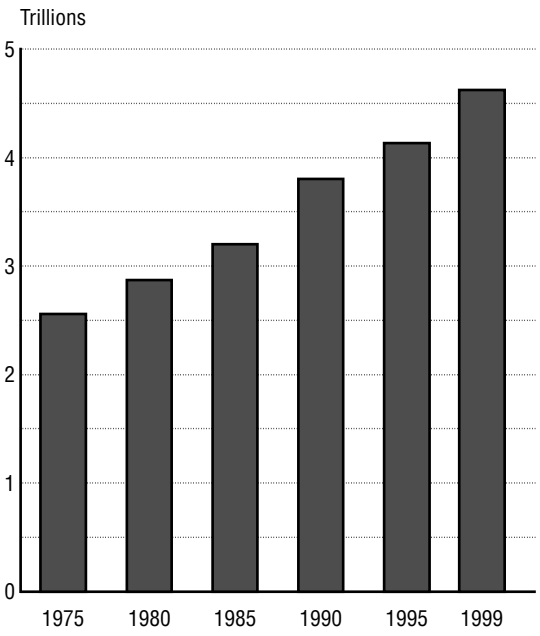
Passenger Travel

All modes of transportation continue to show growth in passenger-miles of travel (pmt). Light trucks (pickups, minivans, and sport utility vehicles) posted the biggest gains, increasing its share of pmt from 14 percent to 31 percent over the 1975 to 1999 period. In absolute terms, passenger travel in light trucks grew from 363 million miles in 1975 to 1.4 trillion miles in 1999. The passenger car share of pmt declined from 76 percent in 1975 to 54 percent in 1999. Air travel also increased its share from 5 percent to 11 percent. Overall, pmt, excluding miles traveled in heavy trucks, grew from about 2.6 trillion in 1975 to 4.6 trillion in 1999 (figure 1). On a per capita basis, people traveled 16,900 miles in 1999 compared with 11,900 in 1975 [3].

Several factors contribute to the continued growth in pmt (figure 2). The resident population, for example, increased by nearly 57 million people, a rise of 27 percent between 1975 and 1999. Moreover, the number of people in the civilian labor force, most of whom commute to work, grew twice as fast as the population over the same period. People also have more money to spend on transportation, particularly for automobiles and air travel. Disposable personal income per capita rose from $14,393 in 1975 to $23,244 in 1999 (in chained 1996 dollars) [2].

An increasing number of people can now afford to buy vehicles and travel services, especially since the cost of the most widely used kinds of transportation—travel in cars and planes—fell in real terms. For example, the inflation-adjusted average airfare for domestic scheduled service declined from $174 in 1975 to $110 in 1995, and has stayed at that level through 1998 (measured in chained 1996 dollars) [3]. Despite recent

Figure 1
Passenger-Miles of Travel

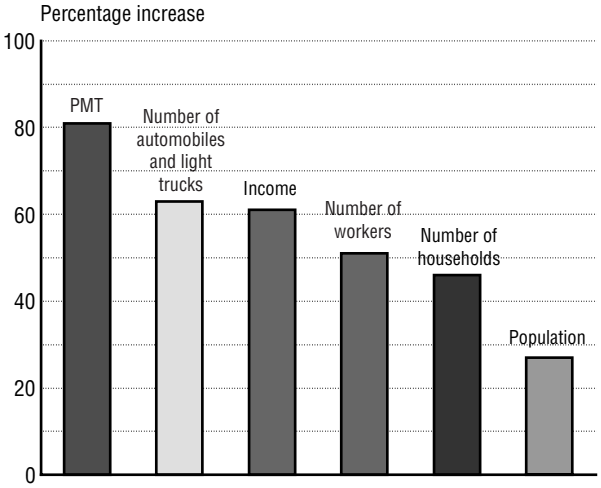


SOURCE: 1975–1995—various sources as cited in U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2000* (Washington, DC: 2001); 1999 data—various sources as compiled by the Bureau of Transportation Statistics.

Estimating Passenger-Miles of Travel

Passenger-miles of travel are estimated on a yearly basis by adding together estimates for each mode, which are derived from separate sources. Passenger-miles of travel for large air carriers and intercity trains are estimated from tickets and are very accurate. A variety of methods are used to estimate travel in other modes, each with different strengths and weaknesses. For more information see the Accuracy Profiles in BTS's *National Transportation Statistics 2000.*

Figure 2
Increases in Passenger-Miles of Travel (PMT) and Factors Affecting Travel Demand: 1975–1999



SOURCES: U.S. Department of Commerce, Census Bureau, *Statistical Abstract of the United States: 2000* (Washington, DC: 2000); various sources as cited in U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2000* (Washington, DC: 2001); and various sources as compiled by Bureau of Transportation Statistics.

increases, gasoline prices, too, have been at historically low levels for much of the past 15 years [1]. However, intercity rail fares decreased only slightly between 1975 and 1995 and intercity bus fares actually increased more than inflation during this period. Rising bus fares tend to affect individuals with lower incomes more than people at higher income levels.

Sources

1. American Petroleum Institute. "How Much We Pay for Gasoline: 1999–April 2000 Review," May 2000, available at http://www.api.org/pasp/biggas.pdf, as of Sept. 9, 2000.
2. U.S. Department of Commerce, Census Bureau, *Statistical Abstract of the United States, 2000, 120th Edition* (Washington, DC: 2001), table 722.
3. U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2000* (Washington, DC: 2001).

Vehicle-Miles of Travel

With increases in both population and individual travel, highway usage has risen substantially. Annual vehicle-miles of travel (vmt) in the United States rose by nearly 30 percent to almost 2.7 trillion miles between 1989 and 1999, an annual increase of 2.5 percent. Vmt per capita rose by just over 16 percent during the same period, an annual increase of 1.5 percent. The most heavily populated states, California, Texas, Florida, and New York, are the most heavily traveled. Wyoming, the least populated state, had the highest vmt per capita in 1999 at 16,200, followed by New Mexico, Alabama, Georgia, and Oklahoma at over 12,600. The District of Columbia, Hawaii, and New York had the lowest vmt per capita at just under 7,000. Overall, the percentage change in vmt per capita between 1989 and 1999 ranged from a 42 percent increase in Mississippi to a 3 percent decline in Hawaii, with 13 states showing an increase of at least 25 percent over the 10-year period (see map on the next page).

In recent years, the makeup of the U.S. vehicle fleet changed as well, altering the share of vmt by vehicle type (figure 1). While the share of total vmt by buses and single-unit and combination trucks has remained relatively constant, the increasing popularity of sport utility vehicles and other light trucks in recent years has resulted in a shift in the percentage of total vmt from automobiles to light trucks. Although still the dominant vehicle type in terms of vmt, the share of automobile vmt declined from 67 percent of total vmt to 58 percent between 1989 and 1999. Over the same period, the percentage of total vmt by light trucks (a classification including vans, pickup trucks, and sport utility vehicles) rose to 33 percent of total vmt [1].

Source

1. U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: Annual issues).

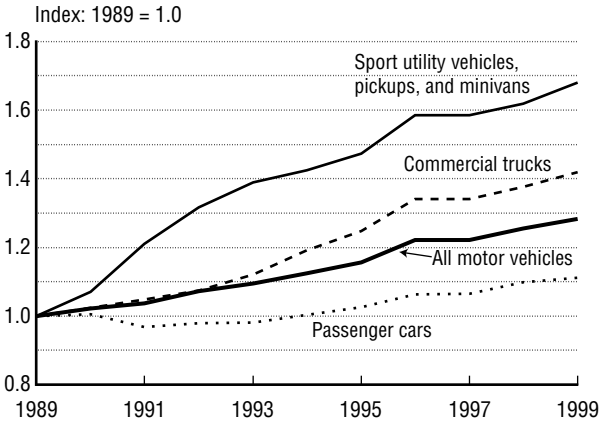
The Highway Performance Monitoring System

The Federal Highway Administration analyzes and presents vehicle-miles of travel data in their annual report, *Highway Statistics,* using the Highway Performance Monitoring System (HPMS). The HPMS compiles state-provided data into a national-level database, combining "sample data on the condition, use, performance and physical characteristics of facilities functionally classified as arterials and collectors (except rural minor collectors) and system-type data for all public road facilities within each State." States report data annually. However, in some years, estimates may be made for states with incomplete data.

Source

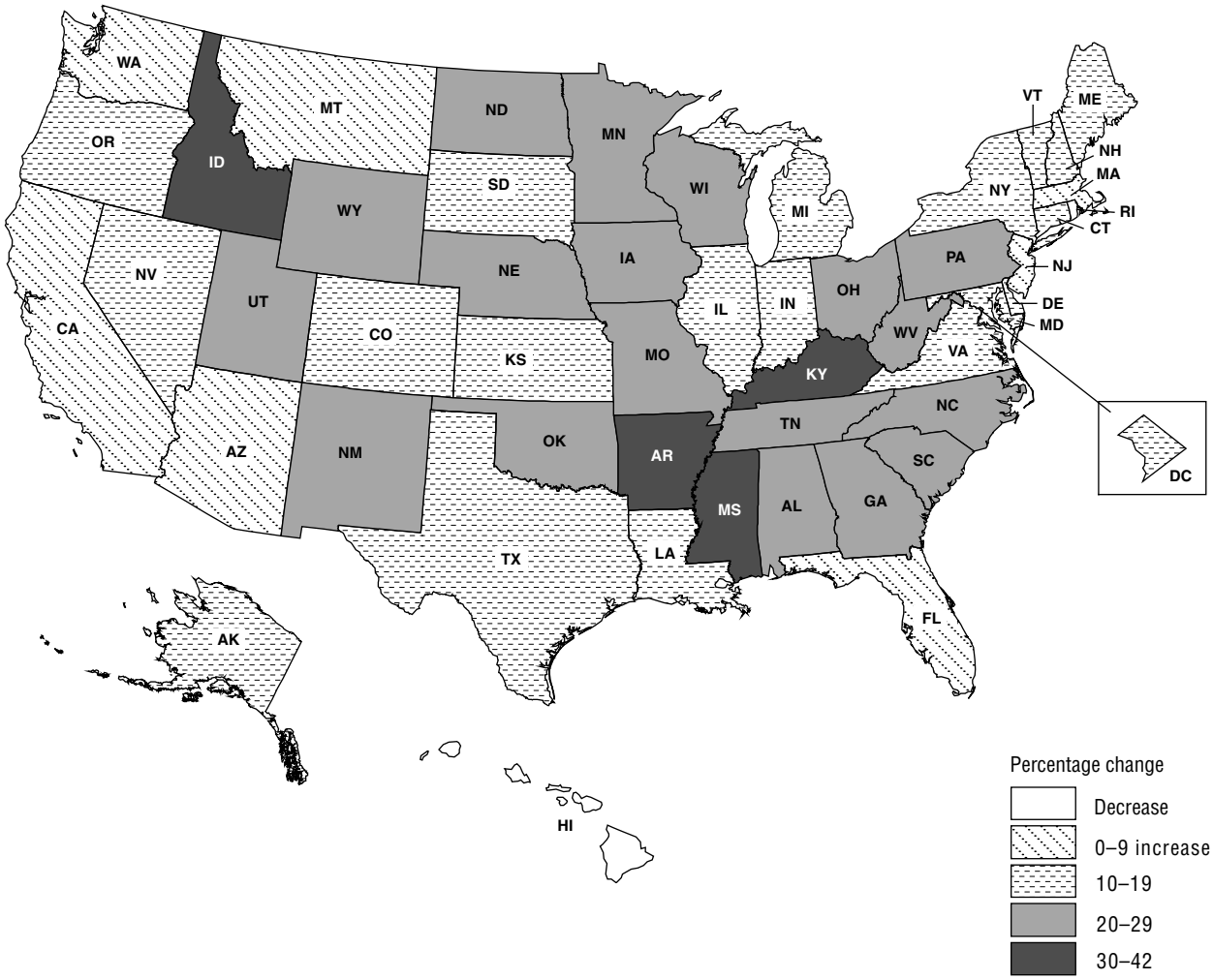
U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics 1998* (Washington, DC: 1999), p. V-1.

Figure 1
Changes in Vehicle-Miles of Travel by Vehicle Type: 1989–1999



SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: Annual issues).

Percentage Change in Vehicle-Miles of Travel: 1989–1999



SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: Annual issues).

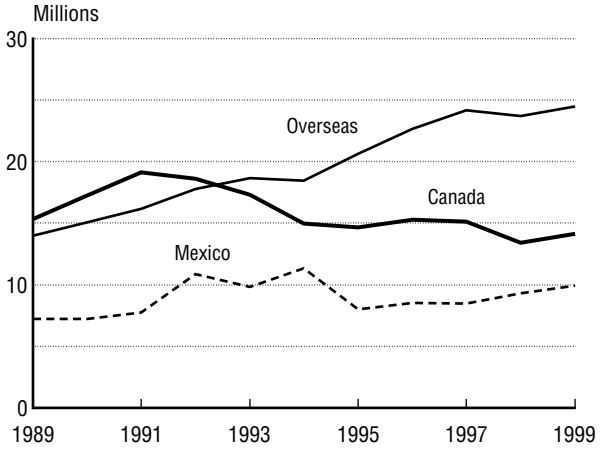
International Travel To and From the United States

Overnight travel between the United States and foreign countries for both business and pleasure shows continual growth overall during the past decade (figures 1 and 2). Although it does not take into account people staying for less than one night (see box), this growth has implications for the infrastructure at America's borders (including airports and land border crossings) and the demand on transportation infrastructure by foreign nationals while they are in the country. There are also economic implications related to travel spending.

Factors that have contributed to growth include the globalization of the production of goods and services, lower priced air transportation, economic growth, and rising incomes in many parts of the world. According to the U.S. Department of Commerce's Tourism Industries Office of the International Trade Administration, the United States had a 7 percent share of worldwide tourist arrivals and 16 percent of worldwide tourist receipts in 1999 [1].

In 1999, a record 48 million international visitors traveled to the United States. Nearly three-

Figure 1
International Visitors to the United States: 1989–1999



SOURCES: U.S. Department of Commerce, International Trade Administration, Office of Tourism Industries, *International Visitors (Inbound) and U.S. Residents (Outbound) (1989–1998)* (Washington, DC: 2000).
____. *Arrivals to the U.S. 1999 & 1998 (All Countries by Residency)* (Washington, DC: 2000).

Data on International Travel To and From the United States

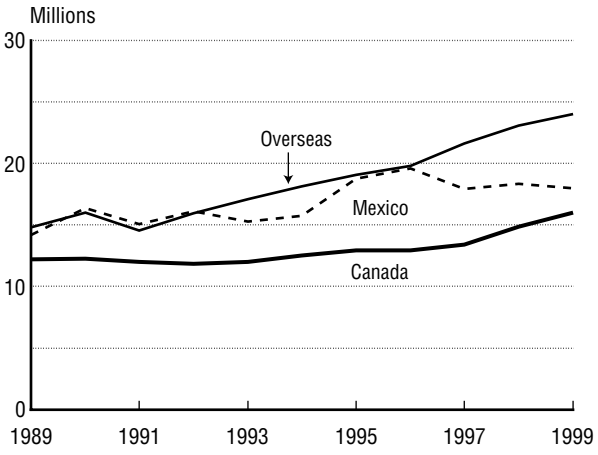
The data here are limited to people staying one or more nights at their international destination and, therefore, do not include all cross-border movements between the United States, Canada, and Mexico. The data for international arrivals reported in this section come mainly from the Visitors Arrivals Program (Form I-94) administered by the U.S. Department of Justice's Immigration and Naturalization Service (INS) in cooperation with the U.S. Department of Commerce's Office of Tourism Industries.

The Visitors Arrivals Program includes overseas visitors staying for one or more nights for a period of less than 12 months whether for business, pleasure, or study. It does not include people transiting the United States en route to another country. Mexican tourist arrival estimates derived from the I-94 program are limited to those visiting the U.S. interior, beyond the 40 kilometer (25 mile) U.S. border zone, and those traveling by air. These data are supplemented by data from Banco de Mexico to report total Mexican arrivals on an annual basis for people staying one or more nights.

For Canadians, the Office of Tourism Industries relies on Statistics Canada's International Visitor Survey to provide monthly inbound visitors (again, for one or more nights) from Canada to the United States.

Data for U.S. residents traveling internationally are derived from the U.S. International Air Travel Statistics (Form I-92) program, also a joint effort between the INS and the Office of Tourism Industries. Data are collected from airlines for all international arriving and departing flights with the exception of those to and from Canada. U.S. resident travel to Canada for one or more nights is provided by Statistics Canada's International Visitor Survey. Estimates of U.S. resident travel to Mexico by means of transportation other than air is provided by Banco de Mexico.

Figure 2
International Trips by U.S. Residents: 1989–1999



SOURCE: U.S. Department of Commerce, International Trade Administration, Office of Tourism Industries, *International Visitors (Inbound) and U.S. Residents (Outbound) (1989–1999)* (Washington, DC: 2000).

quarters of them were from five countries: Canada, Mexico, Japan, the United Kingdom, and Germany (table 1). The number of visitors from overseas (all countries except Canada and Mexico) has risen in the past few years, while the number of visitors from Canada has declined (figure 1). Canadian travel to the United States was 10 percent lower in 1999 than in 1989.

In 1999, U.S. residents made more than 58 million international trips. Major destinations were Mexico, Canada, and the United Kingdom (table 2). International travel by U.S. residents between 1989 and 1999 grew by more than 40 percent, with travel overseas growing the fastest (figure 2).

Source

1. U.S. Department of Commerce, International Trade Administration, Office of Tourism Industries, "June 2000, International Travel and Forecast for the U.S.," 2000, available at http://tinet.ita.doc.gov, as of Oct. 6, 2000.

Table 1
Top 15 Countries of Origin of International Visitors: 1999

Ranking	Country	Number (thousands)	Percent
1	Canada	14,110	29
2	Mexico	9,915	20
3	Japan	4,826	10
4	United Kingdom	4,252	9
5	Germany	1,985	4
6	France	1,059	2
7	Brazil	665	1
8	Italy	626	1
9	Venezuela	552	1
10	Netherlands	527	1
11	Argentina	502	1
12	South Korea	499	1
13	Australia	483	1
14	Taiwan	453	1
15	Colombia	416	1
	Top 15 total	**40,870**	**84**
	Total, all countries	48,491	100

NOTE: Percentages do not add due to rounding.

SOURCE: U.S. Department of Commerce, International Trade Administration, Office of Tourism Industries, "Top 55 Overseas Markets for International Visitor Arrivals to the United States: 1999 and 1998," available at http://tinet.ita.doc.gov, as of Sept. 11, 2000.

Table 2
Top 15 Countries Visited by U.S. Residents: 1999

Ranking	Country	Number (thousands)	Percent
1	Mexico	17,743	30
2	Canada	16,036	27
3	United Kingdom	4,129	7
4	France	2,728	5
5	Germany	1,966	3
6	Italy	1,893	3
7	Jamaica	1,499	3
8	Japan	1,254	2
9	Bahamas	1,254	2
10	Netherlands	1,032	2
11	Spain	909	2
12	Switzerland	787	1
13	Hong Kong	787	1
14	Republic of Korea	688	1
15	Republic of China (Taiwan)	590	1
15	Australia	590	1
	Top 15 total	**53,295**	**91**
	Total, all countries	58,358	100

SOURCES: U.S. Department of Commerce, International Trade Administration, Office of Tourism Industries, "U.S. Resident Travel to Overseas Countries, Historical Visitation: Outbound, 1988–1998," and "Select Destinations Visited by U.S. Resident Travelers: 1999–1998," available at http://tinet.ita.doc.gov, as of Sept. 11, 2000.

Top Passenger Border Crossings

Over 290 million people entered the United States at crossing points on the U.S.-Mexico border in 1999, triple the 90 million entering on the U.S.-Canada border (table 1). Most people traveled across the border in personal vehicles, although a large number of people entered the United States from Mexico on foot. El Paso, Texas, and San Ysidro, California (near San Diego), were the top vehicle crossing points. On the Canadian border, the top crossing points were Detroit, Michigan, and Buffalo-Niagara Falls, New York (table 2).

Table 1
Land Gateways on the Canadian and Mexican Borders: 1999

	Entering the U.S. from	
	Canada (thousands)	Mexico (thousands)
All personal vehicles	34,519	89,639
All buses	182	295
All personal vehicle passengers	87,691	242,613
All bus passengers	4,805	3,495
All train passengers	184	17
All pedestrians	587	48,186
Total passengers and pedestrians	**93,267**	**294,311**

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, special tabulation, August 2000, based on U.S. Department of Treasury, U.S. Customs Service, Office of Field Operations, Operations Management Database, 1999.

Table 2
Top 5 Gateways for Passengers in Personal Vehicles Entering the United States: 1999

	Number (thousands)
Canada	
Detroit, MI	19,382
Buffalo-Niagara Falls, NY	16,532
Blaine, WA	8,443
Sault Ste. Marie, MI	5,766
Port Huron, MI	4,309
Mexico	
El Paso, TX	46,397
San Ysidro, CA	33,593
Hildago, TX	29,119
Calexico, CA	20,372
Brownsville, TX	18,948

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, special tabulation, August 2000, based on U.S. Department of Treasury, U.S. Customs Service, Office of Field Operations, Operations Management Database, 1999.

Enplanements at Major U.S. Airports

Although more than 794 airports in the United States provided some form of air passenger service in 1999, most enplanements (i.e., passenger boardings) occur at a relatively small number of airports. In 1999, over 75 percent of all U.S. air passengers enplaned at only 69 airports located in 29 metropolitan areas identified by the U.S. Department of Transportation, Federal Aviation Administration as large air traffic hubs [2]. The top five air traffic hubs (Chicago, Atlanta, Dallas/Fort Worth, Los Angeles, and San Francisco) alone accounted for over 25 percent of all 1999 enplanements (see map on the next page).

Passenger enplanements at large air traffic hubs have grown at about the same rate as for the nation as a whole. Between 1975 and 1999, air passenger enplanements, nationwide, grew from 197 million to 611 million—a 210 percent increase. Over the same period, enplanements at large air traffic hubs grew from 144 million to 459 million—a 219 percent increase [1, 2].

Air traffic hubs located in major vacation areas (e.g., Orlando and Las Vegas), and those airports that became a hub for a commercial airline (e.g., Charlotte and Phoenix), experienced the greatest growth in enplanements (see the box for the difference between an air traffic hub and a commercial airline hub). Air traffic hubs located in the northeast and midwest, while still experiencing substantial net growth in enplanements, saw their *share* of total enplanements decrease. For example, New York's (John F. Kennedy and LaGuardia) share of total enplanements dropped from a little under 7 percent in 1975 to 3 percent in 1999, and it went from being the second largest air traffic hub to the sixth largest. Three cities identified as large hubs in 1975 (Cleveland, Kansas City, and New Orleans), had less than 1 percent of enplanements in 1999 and are now classified as medium hubs. However, six cities identified as medium hubs in 1975 (Baltimore, Charlotte, Cincinnati, Orlando, Portland (Oregon), and San Diego), increased their share of enplanements to over 1 percent and are now classified as large hubs [1, 2].

What Is a Hub?

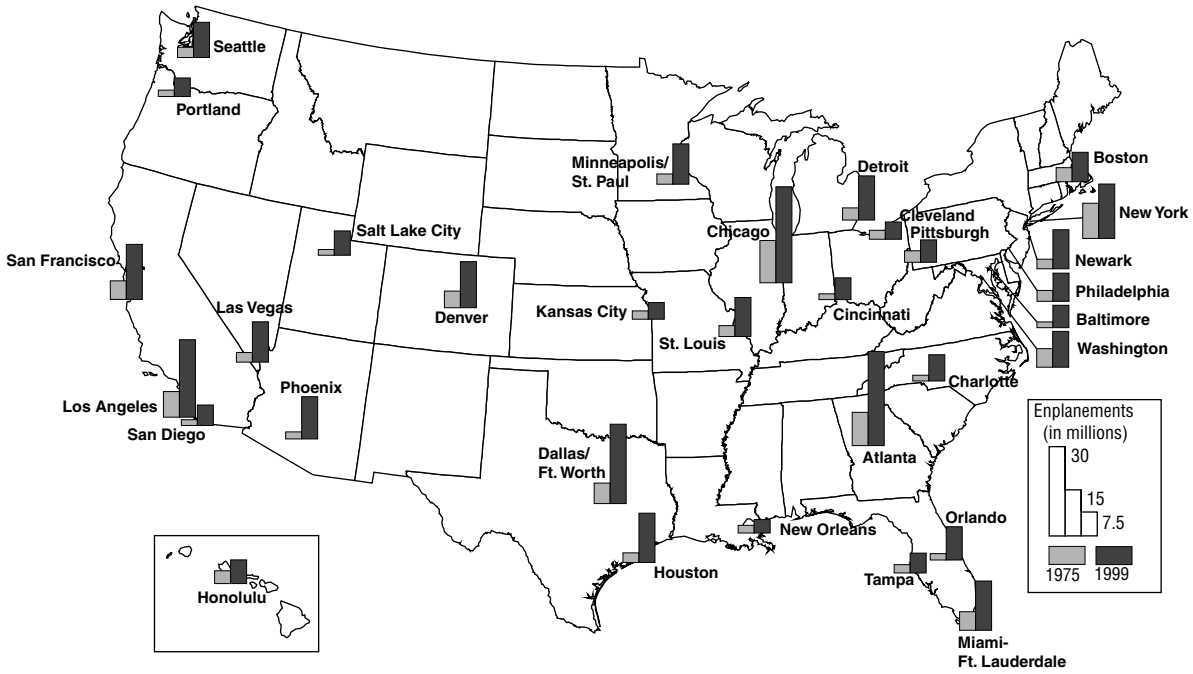
Air traffic hubs are not airports; they are geographical areas providing aviation services. An air traffic hub may be served by more than one commercial service airport (e.g., the Washington, DC, hub is served by Reagan National and Dulles International Airports). A large air traffic hub is an area with 1 percent or more of the total annual enplanements by all U.S. certificated air carriers. Medium hubs have between 0.25 and 0.99 percent of enplanements; small hubs have between 0.05 and 0.24 percent; and nonhubs have less than 0.05 percent of enplanements. This definition should not be confused with airline hub, defined below.

A *commercial airline hub* is not the same thing as an air traffic hub. It refers to an airport that serves as a major transfer point in a commercial air carrier's route system. This practice of routing flights through a hub airport was adopted by most major air carriers following airline deregulation as a way to increase passenger loads to and from airports serving smaller markets.

Sources

1. Civil Aeronautics Board, *Airport Activity Statistics: Twelve Months Ending December 31, 1975* (Washington, DC: 1976).
2. U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Airport Activity Statistics of Certificated Air Carriers: Summary Tables, Twelve Months Ending December 31, 1999* (Washington, DC: 2001).

Enplanements at Large Air Traffic Hubs: 1975 and 1999



NOTE: These data include hubs that were classified as large hubs in either 1975 or 1999 or in both years. A large hub is a geographic area that enplanes 1 percent or more of nationally enplaned passengers. A hub may include more than one airport.

SOURCES: Civil Aeronautics Board, *Airport Activity Statistics: Twelve Months Ending December 31, 1975* (Washington, DC: 1976); U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Airport Activity Statistics of Certificated Air Carriers, Summary Tables, Twelve Months Ending December 31, 1999* (Washington, DC: 2001).

Cruise Ship Vacations

In 1999, a record 9 million passengers took cruise vacations. A total of 6.9 million of these cruised from North American ports, up 16 percent from a year earlier. Table 1 shows the top five North American ports by passenger traffic. The top four North American cruise lines (Carnival, Royal Caribbean, P&O/Princess, and Star) control 82 percent of North American cruise capacity and 75 percent of the world market [1].

Passenger capacity in the North American cruise industry has experienced an average growth rate of 8 percent per year since 1989 [2]. Several factors contributed to this growth including: a strong U.S. economy; the availability of new ships with the latest technologies, rich amenities, and services; and aggressive marketing by cruise lines. North American cruise industry growth is expected to continue, but the level of growth may be affected by negative publicity due to a series of shipboard incidents including fires and groundings. Overcapacity is also a potential concern because of the number of ship deliveries expected over the next few years. World shipyards have a record number of cruise ships on order and under construction [1].

Table 1
Top 5 North American Cruise Passenger Ports: 1990 and 1999
(Millions of passengers handled)

Port	1990	1999
Miami	2.7	3.1
Canaveral	0.8	2.8
Everglades	2.2	2.4
San Juan	0.9	1.1
Los Angeles	0.6	1.0

NOTE: Passengers are counted twice, upon embarkation and debarkation. Includes one-day cruises.

SOURCE: Oivind Mathisen, ed., *Cruise Industry News Annual 2000, Thirteenth Edition* (New York, NY: Cruise Industry News, 2000).

Source

1. Mathisen, Oivind, ed., *Cruise Industry News Annual: Industry Status 2000* (New York, NY: Cruise Industry News, 2000).
2. The McGraw-Hill Companies and U.S. Department of Commerce, International Trade Administration, *U.S. Industry and Trade Outlook 2000, Water Transportation* (New York, NY: The McGraw-Hill Companies, Inc., 2000), p. 52-9.

Passenger Ferries

Ferries carried approximately 90 million passengers in 1999 for work trips, leisure travel, and other purposes. Ferry vessels provide fixed-route service across a body of water and carry passengers, freight, and vehicles. According to a U.S. Department of Transportation, Federal Highway Administration (FHWA) survey, there are 578 ferry terminals, 487 ferry route segments, and 677 ferry vessels operating in the United States and its possessions (table 1). Nearly 82 percent of operating ferry vessels carry passengers; 50 percent of them carry passengers only [4].

Ferries were once used more extensively than they are today. At the end of the 19th century, for example, ferries in New York City carried 200 million passengers a year [1]. However, as more tunnels and bridges were built, ferry operations diminished in importance in many areas. In recent years, the ferry has been reestablished in some communities as a means of travel to and from work, often to ease congestion on crowded highways and bridges. About 30,000 passengers a day (about 8 million per year) now use ferry services between New York City and adjacent points in New Jersey. In San Francisco, about 5,500 passengers per weekday avoid crossing the Golden Gate Bridge by using a combination of ferries and feeder buses. Toll revenues collected on the bridge are used to partially subsidize ferry services in the San Francisco area [2].

Fast ferries—those vessels capable of attaining speeds of at least 25 knots—are becoming more popular. FHWA has identified 65 high-speed ferry route segments, of which all but 1 are passenger-only routes. These routes now account for 13 percent of the total U.S. ferry traffic. Passenger fast-ferry traffic increased at an average annual rate of 12.4 percent between 1993 and 1998. This growth rate is expected to continue through 2004 [3].

Table 1
Top 10 States Ranked by Number of Ferry Terminals: 1999

State	Number of ferry terminals	Number of ferry routes
New York	51	56
Washington	46	55
Alaska	41	65
California	38	39
Maine	33	25
Michigan	31	25
Louisiana	30	15
Massachusetts	27	37
North Carolina	27	16
Virginia	20	14
Total top 10	**344**	**347**
Top 10% of total	**59.5%**	**71.3%**
Overall total	578	487

SOURCE: U.S. Department of Transportation, Office of Intermodal and Statewide Programs, National Ferry Study database, October 2000.

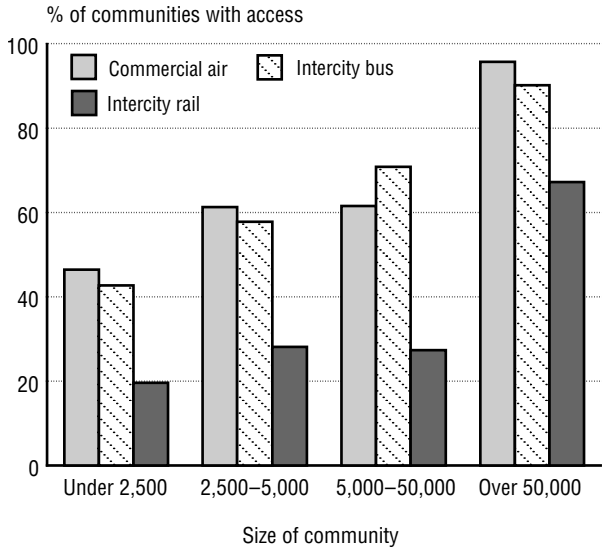
Sources

1. Gorman, Bob, "Clearing the Fog about Ferries: National Study to Shed New Light," *TR News,* No. 209, July–August 2000, p. 12.
2. Kupersmith, Celia, General Manager, Golden Gate Highway and Transportation District, "Making Ferries Work," remarks presented at the conference on U.S. Ferry Transportation Service in the 21st Century, Seattle, WA, June 8–9, 2000, available at http://www.marad.dot.gov/ferry/index.html, as of Sept. 1, 2000.
3. The McGraw-Hill Companies and U.S. Department of Commerce, International Trade Association, "Water Transportation," *U.S. Industry and Trade Outlook 2000* (New York, NY: The McGraw-Hill Companies, 2000), p. 52-9.
4. U.S. Department of Transportation, Federal Highway Administration, National Ferry Database, datafile, as of Sept. 1, 2000.

Access to Intercity Public Transportation Services

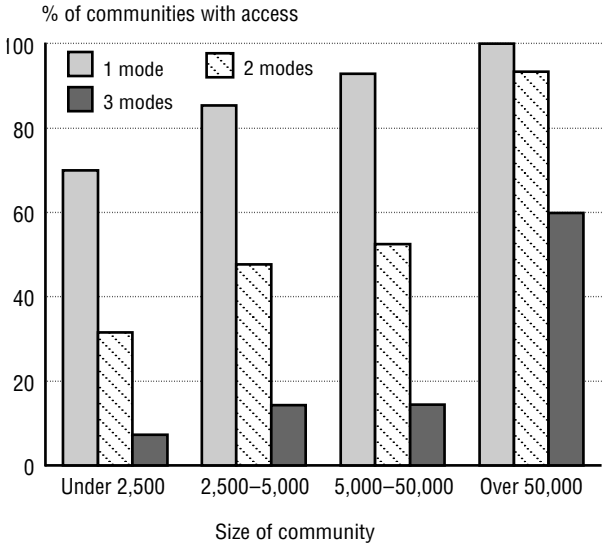
Access to intercity public transportation services, such as commercial air carriers, passenger rail service, and scheduled intercity buses, is an important indicator of the nation's mobility. For example, over 95 percent of the U.S. population lives within a reasonable access distance[1] of intercity public transportation services [1]. People living in larger urban areas enjoy the greatest levels of accessibility. Every community with a population of 50,000 or more has access to least one intercity transportation mode—an airport, Amtrak rail station, or intercity bus terminal—and over 95 percent of these communities have access to two or more modes (figures 1 and 2).

Figure 1
Communities with Access to Intercity Public Transportation by Mode



SOURCE: B.D. Spear and R.W. Weil, "Access to Intercity Transportation Services from Small Communities: A Geospatial Analysis," *Transportation Research Record 1666* (Washington, DC: Transportation Research Board, 1999).

Figure 2
Communities with Access to Intercity Public Transportation by Number of Modes



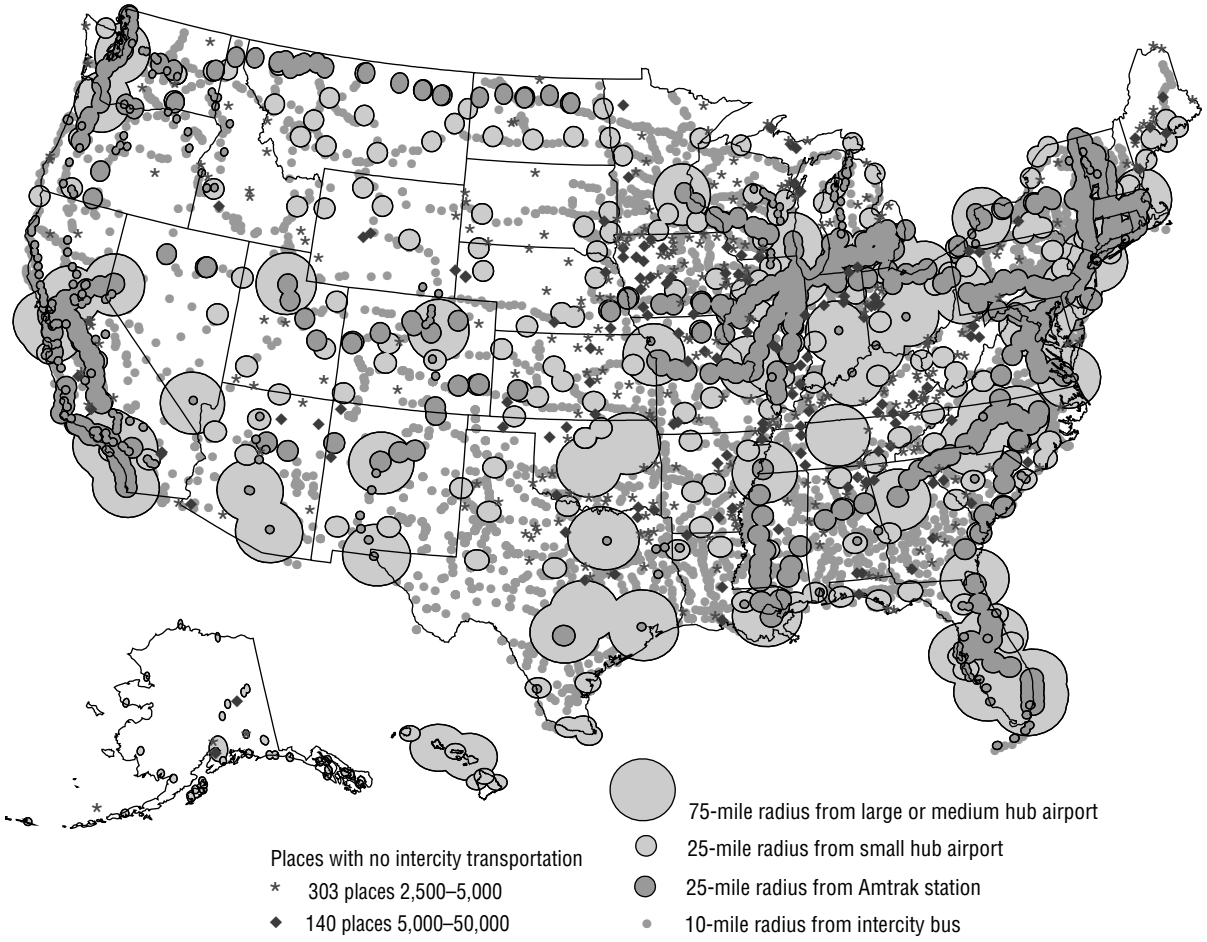
SOURCE: B.D. Spear and R.W. Weil, "Access to Intercity Transportation Services from Small Communities: A Geospatial Analysis," *Transportation Research Record 1666* (Washington, DC: Transportation Research Board, 1999).

People in small urban communities also have reasonable access to intercity public transportation. Nearly 90 percent of the 4,046 communities with populations between 2,500 and 50,000 located outside of larger urban areas have access to at least one intercity transportation mode. Of the 443 communities located beyond a reasonable access distance, 25 percent are located within the Appalachian or Mississippi Delta Regions, and another 15 percent are concentrated in and around the state of Iowa [1].

Not surprisingly, only 70 percent of rural communities with populations of less than

[1] *Reasonable access distance* is defined as within 75 miles of a large or medium hub airport, 25 miles of a small or nonhub airport, 25 miles of an Amtrak rail station, or 10 miles of an Amtrak or intercity bus stop.

Access to Transportation Services



SOURCE: B. D. Spear and R.W. Weil, "Access to Intercity Transportation Services from Small Communities: A Geospatial Analysis," *Transportation Research Record 1666* (Washington, DC: Transportation Research Board, 1999).

2,500 have accessible intercity public transportation services; however, they represent only 1 percent of the total U.S. population. A majority of these communities are located in the Central Great Plains states (i.e., Kansas, Nebraska, Iowa, and North and South Dakota), and in the Appalachian and Mississippi Delta Regions (see map). Some states and communities in these areas have established bus services to help residents get to public transportation modes.

A recent analysis compared the demographic characteristics of people living in communities with and without access to intercity public transportation service. The analysis showed that people living in communities with no accessible service, on average, have lower incomes, are less likely to have a college education, and are more likely to be white and over 65 years old. [1].

Source

1. Spear, B.D. and R.W. Weil, "Access to Intercity Transportation Services from Small Communities: A Geospatial Analysis," *Transportation Research Record 1666* (Washington, DC: Transportation Research Board, 1999).

Commuting to Work

Between 1985 and 1999, the percentage of people driving to work alone grew, while the percentage of workers carpooling declined. Transit's share of commuters changed little over this period (table 1 and figure 1).

Distances traveled to work increased over this period. In 1999, the median commute to work was 10 miles, up from 8 miles in 1985. About 1 in 3 workers traveled less than 5 miles to work (excluding those that either work at home or have no fixed place of work), while another half traveled between 5 and 20 miles. A very small percentage (about 2 percent) traveled 50 miles or more to work. The remainder reported no fixed place of work or worked at home [1].

The median commute time rose from 19 minutes in 1985 to 21 minutes in 1999. For those individuals reporting a commute, almost three-quarters spent less than half an hour each day getting to work in 1999. About 5 percent spent an hour or more commuting. Workers with incomes below the poverty level are more likely to live closer to work (a median of 7 miles compared with 10 miles for all workers), and spend less time getting to work (a median of 19 minutes compared with 21 minutes for all workers) [1].

Almost half of all workers leave for work between 7:00 a.m. and 9:00 a.m., the traditional morning rush period. The largest number leave between 7:00 a.m. and 8:00 a.m.; another 20 percent leave home between 6:00 a.m. and 7:00 a.m. Between 1985 and 1999, only minor changes have occurred in the times people leave for work (figure 2) [1].

Table 1
Mode of Travel to Work: 1999

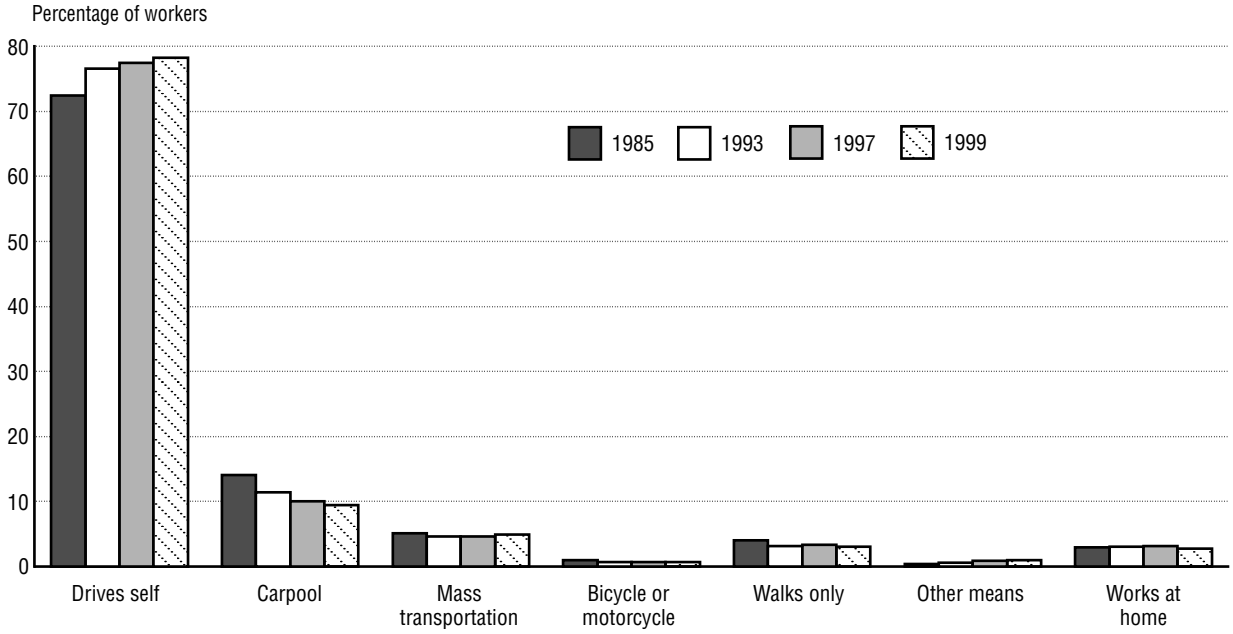
Mode	Percent
Drives self	78.2
Carpool	9.4
Mass transportation	4.9
Walks only	3.1
Bicycle or motorcycle	0.6
Taxicab	0.1
Other means	0.8
Works at home	2.8

SOURCE: U.S. Department of Housing and Urban Development and U.S. Department of Commerce, U.S. Bureau of the Census, *American Housing Survey for the United States: 1999,* H150/99 (Washington, DC: 2000).

Source

1. U.S. Department of Housing and Urban Development and U.S. Department of Commerce, U.S. Bureau of the Census, *American Housing Survey for the United States: 1999,* H150/99 (Washington, DC: 2000).

Figure 1
How People Get to Work: 1985–1999



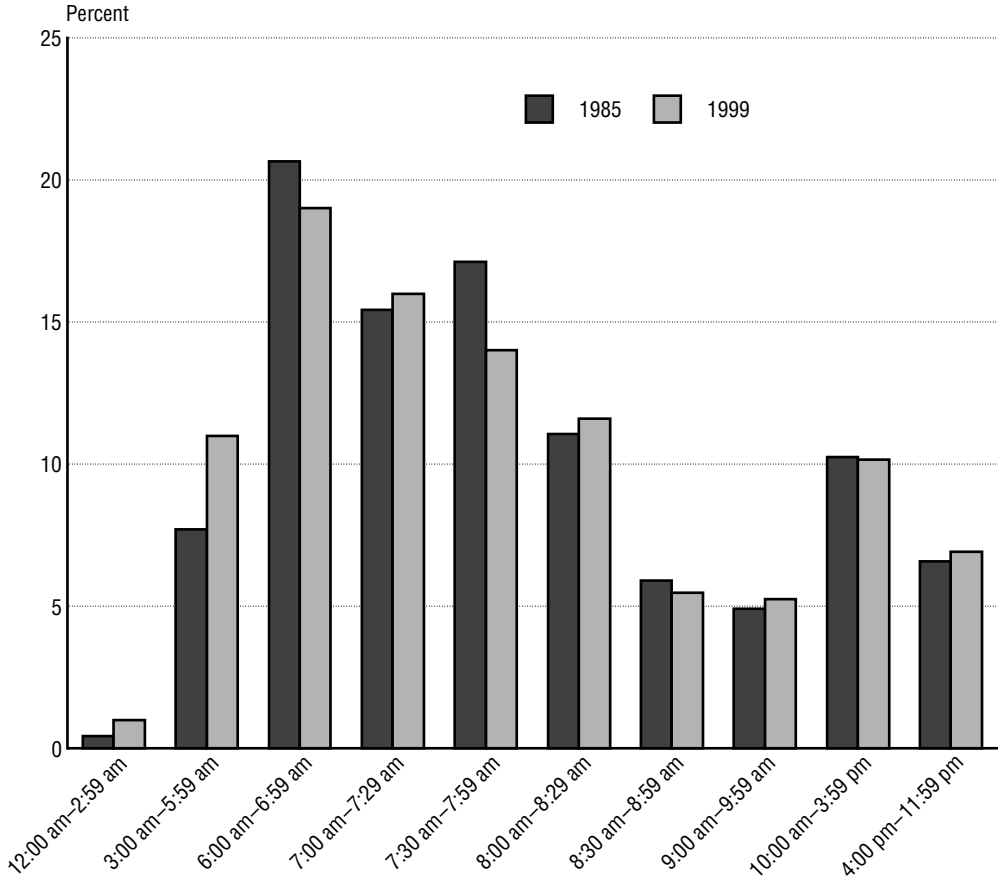
SOURCE: U.S. Department of Housing and Urban Development, American Housing Survey, various years.

Journey-to-Work Data

Three national sources of data provide information on the journey to work:

1. The Census Bureau administers the **decennial census "long form,"** which contains several questions on the journey to work, to approximately 1 in 6 households (about 15 million in 1990). The census provides the most detailed demographic and geographic information on commuting behavior. The decennial census includes the Census Transportation Planning Package, a set of special tabulations on commuting for state, county, county subdivision, places over 2,500, and traffic analysis zones.
2. The **American Housing Survey** (AHS) contains many of the same commuting questions as the decennial census. Every odd year, the Census Bureau conducts the AHS for the Department of Housing and Urban Development with a sample of about 53,000 households nationwide.
3. The Federal Highway Administration conducts the **Nationwide Personal Transportation Survey** (NPTS) approximately every 5 years. (The NPTS is now part of the National Household Travel Survey.) In 1995, the NPTS surveyed a national sample of about 42,000 households. Respondents recorded all trips, including work trips, made on a single day in a trip diary. The diary provided data on work trips (if the respondents went to work on that day) and their relationship to other activities and trips that day. Demographic and geographic data were collected for all respondents.

Figure 2
When People Leave Home to Go to Work: 1985 and 1999



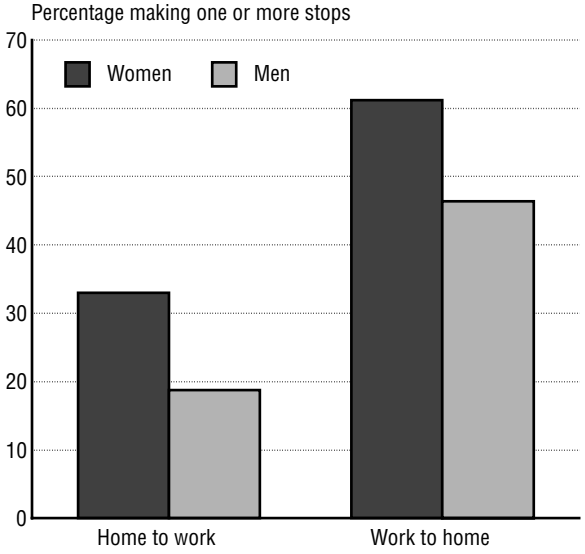
SOURCE: U.S. Department of Housing and Urban Development, American Housing Survey, various years.

Trip Chaining

People often link local trips together in what is known as trip chaining (e.g., dropping a child off at school before traveling to work). In an analysis of trip chaining involving home-to-work and work-to-home trips using data from the latest Nationwide Personal Transportation Survey, researchers found that people are more likely to stop on their way home from work than on their way to work, and women are more likely to trip chain than men [1] (figure 1). Common reasons for trip chaining include shopping, conducting family and personal business, socializing, and to pick up or drop off a passenger.

Trip chaining is thought to be increasing because of rising incomes, the entry of women into the workforce, and the increasing use of automobiles [1]. Many household-sustaining goods and services are now often bought rather than provided in the home (e.g., child care and meals), because more time is spent at work and less time is available for family-oriented needs. As a result, people are making extra trips, and these trips are very often chained with the work commute to save time. In addition, the ability to link trips is enhanced by the flexibility provided by the automobile. Linking nonwork-related trips with the work commute has been posited as one reason for increased congestion problems at rush hour [2].

Figure 1
Trip Chaining Involving Work Trips, by Men and Women: 1995



SOURCE: N. McGuckin and E. Murakami, "Examining Trip-Chaining Behavior: A Comparison of Travel by Men and Women," 1999, available at www-cta.ornl.gov/npts/1995/Doc/publications.shtml.

Sources

1. McGuckin, N. and E. Murakami, "Examining Trip-Chaining Behavior: A Comparison of Travel by Men and Women," 1999, available at http://www-cta.ornl.gov/npts/1995/Doc/publications.shtml.
2. Strathman, J.G. and K.J. Dueker, *Understanding Trip Chaining, Special Report on Trip and Vehicle Attributes,* 1990 NPTS Report Series (Washington, DC: U.S. Department of Transportation, Federal Highway Administration, 1995).

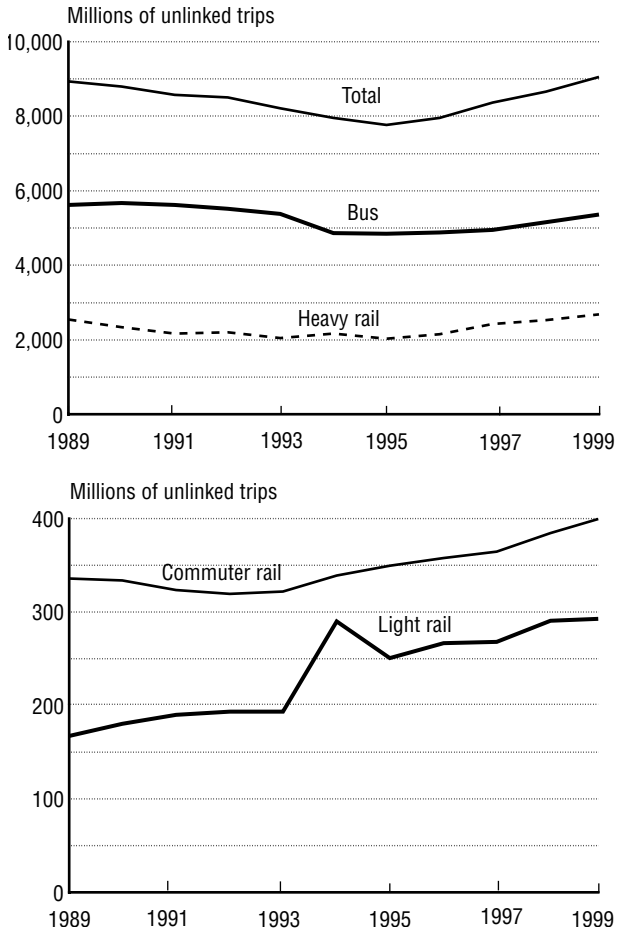
Transit Ridership

Transit ridership has grown steadily since 1995 to top 9 billion (unlinked) trips in 1999 [1]. Preliminary data from the American Public Transportation Association show that another 320 million rides were added in 2000, bringing the growth since 1995 to 20 percent [2]. This ridership level is the highest in more than 40 years. Rail transit ridership posted particularly strong growth (figure 1). Between 1989 and 1999, light rail grew 77 percent, followed by commuter rail at 19 percent, and heavy rail at 6 percent. By comparison, bus ridership fell by nearly 5 percent over this period, although it too has rebounded since 1995. Moreover, most transit trips are still taken by bus [3].

Sources

1. American Public Transportation Association, "APTA Transit Ridership Report," available at http://www.apta.com/stats/ridershp/history.pdf, as of Mar. 8, 2001.
2. _____. "Public Transportation Scored Another Record Year in 2000," press release, Jan. 10, 2001.
3. _____. *Transit Factbook 2000* (Washington, DC: 2000).

Figure 1
Transit Ridership by Mode: 1989–1999



NOTE: Total includes other modes not shown, such as ferry boats, inclined planes, and trolley buses.

SOURCE: American Public Transportation Association, *Transit Fact Book 2000* (Washington, DC: 2000).

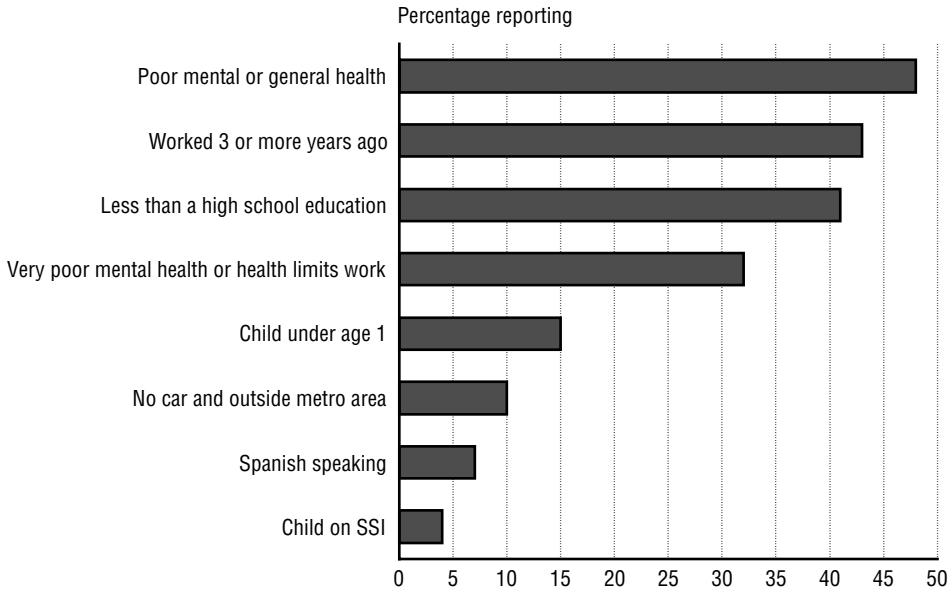
Welfare to Work

Changes in our nation's welfare system since 1996 have resulted in a rapidly shrinking number of welfare recipients. About 6 million Americans left the welfare rolls between August 1996, when a sweeping welfare overhaul was signed into law, and June 2000. There were 53 percent fewer individuals and 50 percent fewer families on welfare in June 2000 than in August 1996. Welfare rolls dropped in every state over this period, in some cases, by 90 percent [2].

Because of these changes, communities are becoming increasingly aware that providing adequate and reliable transportation is one of the keys to moving people from welfare to work and helping them keep jobs. A 1997 U.S. Conference of Mayors survey of municipal officials found that 84 percent of respondents identified transportation as one of the most serious barriers for welfare recipients [1]. Moreover, a nationwide sample survey of welfare households found that 10 percent lived outside a metropolitan area had no car [4]. Other obstacles, however, were cited by more respondents and included poor health, lack of work experience, poor education, childcare problems, and lack of English language skills (figure 1).

In metropolitan areas, "spatial mismatch" often occurs when the greatest concentration and growth of job opportunities, particularly entry-level jobs,

Figure 1
Obstacles to Working Reported by Temporary Assistance for Needy Families (TANF) Recipients: 1997



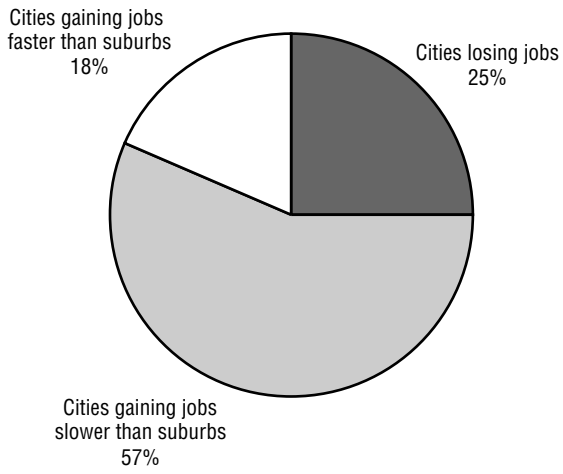
KEY: SSI = Supplemental Security Income.

SOURCE: S.R. Zedlewski, *Work Activity and Obstacles to Work Among TANF Recipients* (Washington, DC: The Urban Institute, 1999).

is in the suburbs, and the greatest concentration of welfare and former welfare recipients is in the central cities. The challenge is, thus, making public transportation available so that it is reasonably possible for these individuals to get to work (figure 2). A Boston area study found that 98 percent of welfare recipients lived within one-quarter mile of a bus or transit station, but only 32 percent of potential employers were that close [3]. Even with transit access, trips often take too long or require several transfers. Furthermore, many entry-level jobs, especially in the service and retail sectors, require employees to work late hours and weekends, times that are often not well served by transit service geared to the standard "8-to-5" workday.

The federal Job Access and Reverse Commute grant program, which is administered by the U.S. Department of Transportation, Federal Transit Administration, was created to respond to these problems. As part of the Transportation Equity Act for the 21st Century, the program assists states and localities in developing new or expanded transportation services that connect welfare recipients and other low-income persons to jobs and other employment-related services. Job Access projects are targeted at developing new and expanding existing transportation services, such as shuttles, vanpools, bus routes, connector services to mass transit, and guaranteed-ride-home programs for welfare recipients and low-income persons. Reverse Commute projects provide transportation services to suburban employment centers from urban, rural, and other suburban locations for all populations.

Figure 2
Metropolitan Job Decentralization: 1993–1996



SOURCE: J. Brennan and E. W. Hill, *Where Are the Jobs? Cities Suburbs, and the Competition for Employment* (Washington, DC: The Brookings Institution Center on Urban & Metropolitan Policy, 1999).

Sources

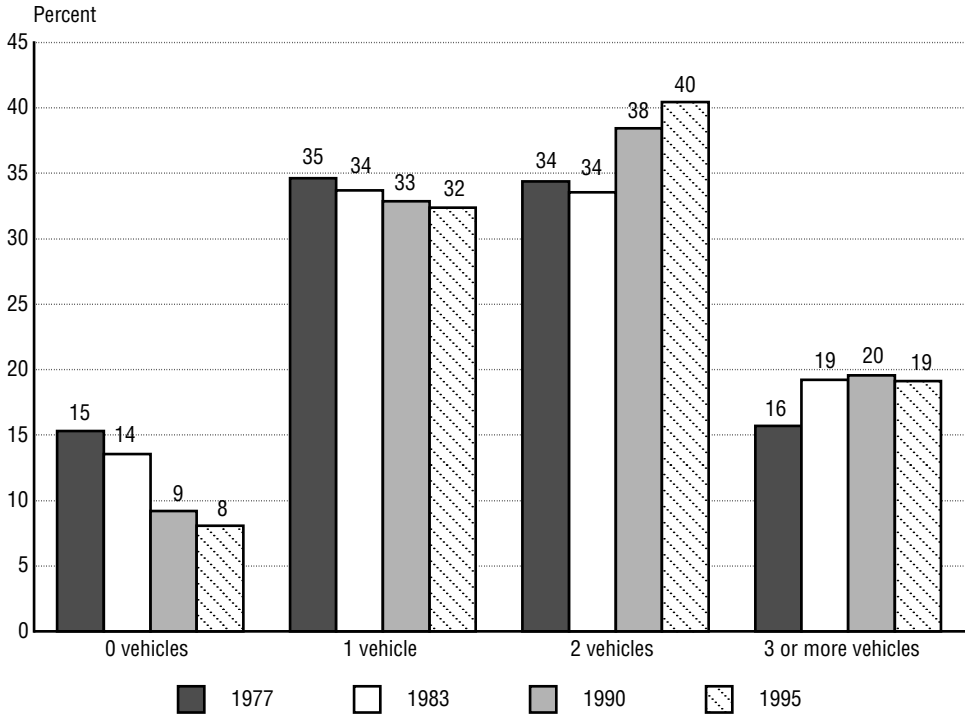
1. U.S. Conference of Mayors, *Implementing Welfare Reform in America's Cities: A 34-City Survey* (Washington, DC: 1997).
2. U.S. Department of Health and Human Services, *Change in TANF Caseloads Since Enactment of New Welfare Law,* 2000, available at http://www.acf.dhhs.gov/news/stats/aug-dec.htm, as of Sept. 29, 2000.
3. Lacombe, Annalynn, *Welfare Reform and Access to Jobs in Boston,* BTS98-A-02 (Washington, DC: U.S. Department of Transportation, Bureau of Transportation Statistics, 1998).
4. Zedlewski, S.R., *Work Activity and Obstacles to Work Among TANF Recipients* (Washington, DC: The Urban Institute, 1999).

Growth in the Number of Vehicles per Household

Despite shrinking household size, the number of private motor vehicles per household has grown appreciably since the mid-1970s. In 1977, for example, a large percentage of families owned one vehicle. Now, most families own two or more vehicles, and nearly one-fifth of households own three or more vehicles (figure 1 and table 1). Several factors account for this growth, including a rise in household income, greater availability of used vehicles because of increased longevity, and the greater need for a vehicle because of suburban development, among other things [1].

Nevertheless, in the 1990s, growth in the number of household vehicles slowed to the growth in the number of eligible drivers (population 16 years of age or older). Both the number of household vehicles per person 16 years of age or older and the licensing rate remained at about 0.9 between 1990 and 1995 (table 2). Thus, it appears that the number of vehicles per household has reached a plateau equaling the number of licensed drivers per household [1].

Figure 1
Percentage of Households by Number of Vehicles: 1977–1995



SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey* (Washington, DC: 2000).

Table 1
Comparison of Household Size and Number of Household Vehicles: 1977–1995

Year	Household vehicles (thousands)	Vehicles per household	Persons per household
1977	120,098	1.59	2.86
1983	143,714	1.68	2.73
1990	165,221	1.77	2.63
1995	176,067	1.78	2.65

SOURCES: U.S. Department of Transportation, Federal Highway Administration, *Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey* (Washington, DC: 2000); and U.S. Department of Commerce, U.S. Census Bureau, "Households by Size: 1960 to Present," 2000, available at http://www.census.gov/population/socdemo/hh-fam/htabHH-4.txt, as of Aug. 31, 2000.

Table 2
Household Vehicles and Licensed Drivers: 1977–1995

Year	Vehicles per person 16 or older	Licenses per person 16 or older
1977	0.76	0.81
1983	0.82	0.84
1990	0.90	0.89
1995	0.89	0.89

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey* (Washington, DC: 2000).

Source

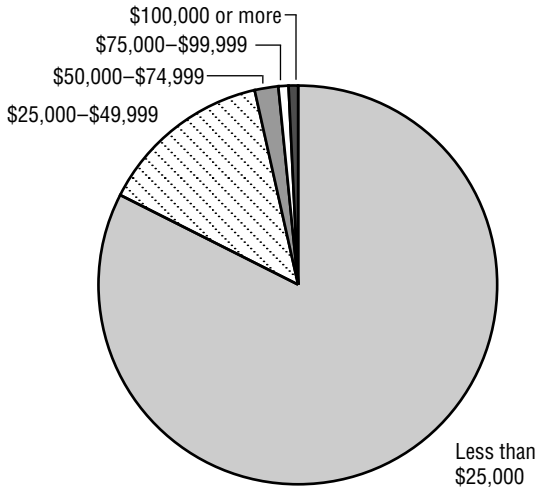
1. U.S. Department of Transportation, Federal Highway Administration, *Summary of Travel Trends: 1995 Nationwide Personal Transportation Survey* (Washington, DC: 2000).

Households Without Vehicles

Because of improvements in vehicle reliability and longevity and rising incomes, many more people now own a vehicle than in the mid-1970s. In 1995, the number of vehicleless households had declined to about 8 percent of all households, which is about half the share reported 20 years earlier.

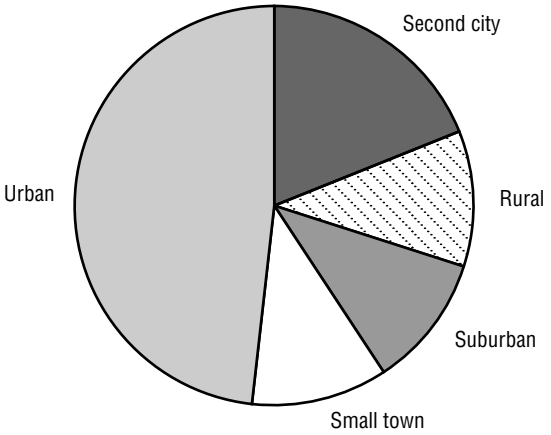
About four out of every five households without a vehicle had an annual income of less than $25,000 (among households that reported their income) (figure 1). Half of vehicleless households are in cities. Rural, suburban, and small town households account for about 10 percent each (figure 2). The remaining one-fifth of vehicleless households live in second cities, places that are near an urban center but have a density greater than the typical suburb. Partly because of income and location, African-American households are much more likely to be without a vehicle than other racial and ethnic groups (figure 3).

Figure 1
Vehicleless Households by Income: 1995



SOURCE: U.S. Department of Transportation, Federal Highway Administration, *1995 Nationwide Personal Transportation Survey,* Microdata Files CD-ROM (Washington, DC: 1997).

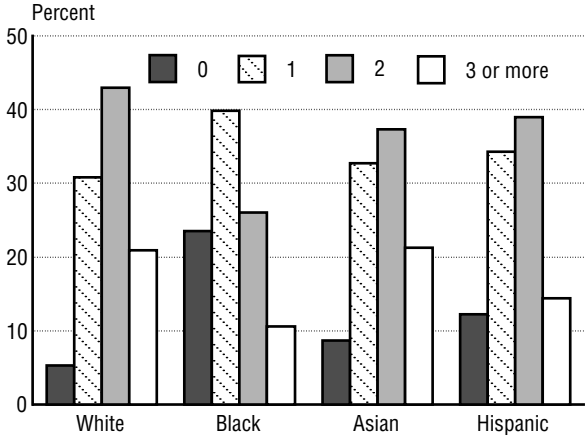
Figure 2
Vehicleless Households by Location: 1995



NOTE: Second cities are areas near an urban center, but with a density greater than the typical suburb.

SOURCE: U.S. Department of Transportation, Federal Highway Administration, *1995 Nationwide Personal Transportation Survey,* Microdata Files CD-ROM (Washington, DC: 1997).

Figure 3
Households by Number of Vehicles and Race/Ethnicity: 1995



SOURCE: U.S. Department of Transportation, Federal Highway Administration, *1995 Nationwide Personal Transportation Survey,* Microdata Files CD-ROM (Washington, DC: 1997).

Disabilities and Health Factors That Affect Travel

A recent Bureau of Transportation Statistics survey found that 15 percent of adults in the United States have a disability or a health problem that makes travel difficult. Using a random sample of 1,000 adults, the survey also found that about one-third of those reporting difficulties were 65 years of age or older [2].

Data from the National Health Interview Survey on Disability 1994–1995 (NHIS-D) showed that about 72 percent of people with a disability drive a car (an estimated 30 million people), with 24 million driving every day or nearly every day and 6 million driving occasionally or seldom (see box). However, an estimated 5.5 million people do not drive because of an impairment or health problem—nearly half of the disabled adults who do not drive—and more than 40 percent of these individuals live in the suburbs (table 1).

The NHIS-D asked people about their use of standard public transportation in the 12 months prior to being interviewed. About two-thirds of disabled adults, an estimated 27.8 million, lived in areas where regular public transportation is available, but only 6.4 million people had used it during the period in question. This was, however, about three times the number who had used demand responsive services. Overall, about 12 percent of people with disabilities (700,000) who had used public transportation in the past year said they had difficulty using the system, a proportion somewhat higher in the central city than elsewhere. The most common problems were difficulty walking, followed by the need for assistance, and mental cognitive problems. Inadequate hours, cost, and fear were infrequently mentioned by users and non-users (table 2). Of people with cognitive/mental problems (e.g., remembering where to go/knowing how to avoid trouble) only about 6 percent (49,000 people) said they would use public transportation if they were given mobility training (e.g., what stop to get off, how to transfer, how to pay the fare) [1].

Of the 21.4 million who had not used transit in an area where it is available, about 15 percent said it was because of an impairment. The main reasons given were the same as for disabled users. Nearly 600,000 non-users have wheelchair access problems. Another 80,000 people with disabilities who had used public transportation in the past 12 months also have wheelchair access problems [1].

National Health Interview Survey on Disability (NHIS-D)

The NHIS-D was conducted by the National Center for Health Statistics as a supplement to the National Health Interview Survey, a nationally representative sample survey. The NHIS-D 1994–1995 was conducted in two phases. Phase 1 included a sample of approximately 203,000 individuals who were interviewed in 1994 and 1995. About 34,000 adults and children (20,000 in 1994 and 14,000 in 1995) indicated some form of disability, yielding a nationally representative estimate of about 42 million disabled adults in the household population (excluding people in long-term care facilities and prisons).

In phase 2, adults and children who indicated they had a disability in phase 1 were reinterviewed over a period stretching from 1994 to 1997 using two different questionnaires. Adults were asked for more detailed information on a range of subjects including 12 transportation questions in one section. Some questions in other sections of the interview also included transportation components. Data are based on a sample and subject to sampling variability.

Table 1
Drivers with Disabilities and Nondrivers

	Total		MSA, central city		MSA, not central city		Non-MSA	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Drive	**30,078,020**	**72**	**8,210,746**	**64**	**13,906,868**	**76**	**7,960,406**	**74**
Every day or nearly everyday	24,112,493		6,394,213		11,416,503		6,301,777	
Occasionally or seldom	5,965,527		1,816,533		2,490,365		1,658,629	
Never drive	**11,616,198**	**28**	**4,548,167**	**36**	**4,328,966**	**24**	**2,739,065**	**26**
Because of an impairment or health problem	5,474,326		1,785,747		2,252,446		1,436,133	
Total	**41,694,218**	**100**	**12,758,913**	**100**	**18,235,834**	**100**	**10,699,471**	**100**

KEY: MSA = metropolitan statistical area.

SOURCE: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, *1994–1995 National Health Interview Survey, Phase II* (Hyattsville, MD: July 1998).

Table 2
Types of Difficulties Cited by Users and Non-Users of Public Transportation

	Total		Used public transport but has difficulties		Has not used public transport because of difficulties	
	Number of adults (thousands)	Percent	Number of adults (thousands)	Percent	Number of adults (thousands)	Percent
Total respondents	**3,870**	**100**	**747**	**100**	**3,124**	**100**
Difficulties cited						
Difficulty walking/cannot walk	2,530	65	426	57	2,104	67
Need help from another person	1,158	30	126	17	1,032	33
Other reasons not specified	762	20	210	28	551	18
Cognitive mental problems	757	20	96	13	661	21
Wheelchair/scooter access problems	665	17	83	11	583	19
Vision	622	16	75	10	547	18
Fear	424	11	79	9	354	11
Hearing	240	6	27	4	213	7
Problems with other medical/assistive device	235	6	29	4	207	7
Weather	222	6	51	7	171	5
Cost	74	2	24	3	50	2
Hours inadequate	58	2	22	3	36	1

NOTE: Difficulties cited do not add to total as more than one difficulty was recorded for many respondents.

SOURCE: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, *1994–1995 National Health Interview Survey, Phase II* (Hyattsville, MD: July 1998).

Although being able to drive is an important source of mobility for many people, including people with a disability, car crashes can also cause disability. The NHIS-D found that about 1.1 million people have a problem with at least one of the activities of daily living (e.g., bathing, dressing, eating, or moving inside the home) because of a motor vehicle crash [1].

Sources

1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, *1994–1995 National Health Interview Survey on Disability, Phase I and II* (Hyattsville, MD: July 1998).
2. U.S. Department of Transportation, Bureau of Transportation Statistics, "Omnibus Survey: Household Survey Results," August 2000.

Highway Congestion in Metropolitan Areas

Being stuck in traffic is a source of frustration for many travelers, particularly commuters, but its impacts go far beyond those individuals immediately affected. By wasting people's time, increasing the time it takes to transport goods, and causing missed meetings and appointments, highway congestion is a drag on economic productivity. Congestion is also an environmental concern. Extra fuel is consumed by cars traveling under these conditions because of increased acceleration, deceleration, and idling. Greater fuel consumption leads to higher emissions of greenhouse gases and may raise the level of other air pollutants.

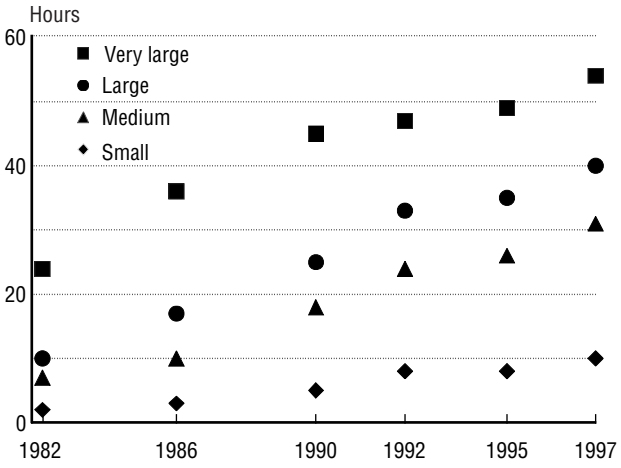
The Texas Transportation Institute (TTI) studied 68 metropolitan areas in order to estimate congestion and some of its impacts in the United States. TTI found that between 1982 and 1997 congestion measured by average annual delay per eligible driver increased in all areas (see the map on the next page). Overall in the study areas, average annual delay per driver has almost tripled during the 15-year period, rising from 16 hours per driver in 1982 to 45 hours in 1997 (table 1). (More recent data from TTI show congestion continued to increase between 1997 and 1999.) Furthermore, drivers in the largest metropolitan areas (with a population of over 3 million) experienced the worst congestion (54 hours per driver on average in 1997), and those in small metropolitan areas (population of 500,000 or less) the least (10 hours a year per driver) (figure 1).

Table 1
Congestion Measures in 68 Metropolitan Areas: 1982–1997

Year	Annual delay per eligible driver (person-hours)	Wasted fuel per eligible driver (gallons)	Annual fuel wasted per urban area (million gallons)
1982	16	23	39
1986	27	32	54
1990	34	39	68
1992	39	44	76
1995	40	51	84
1996	43	54	91
1997	45	69	97

SOURCE: D. Shrank and T. Lomax, *The 1999 Annual Mobility Report: Information for Urban America* (College Station, TX: Texas Transportation Institute, 1999).

Figure 1
Annual Hours of Congestion Delay Per Driver by Metropolitan Area Size

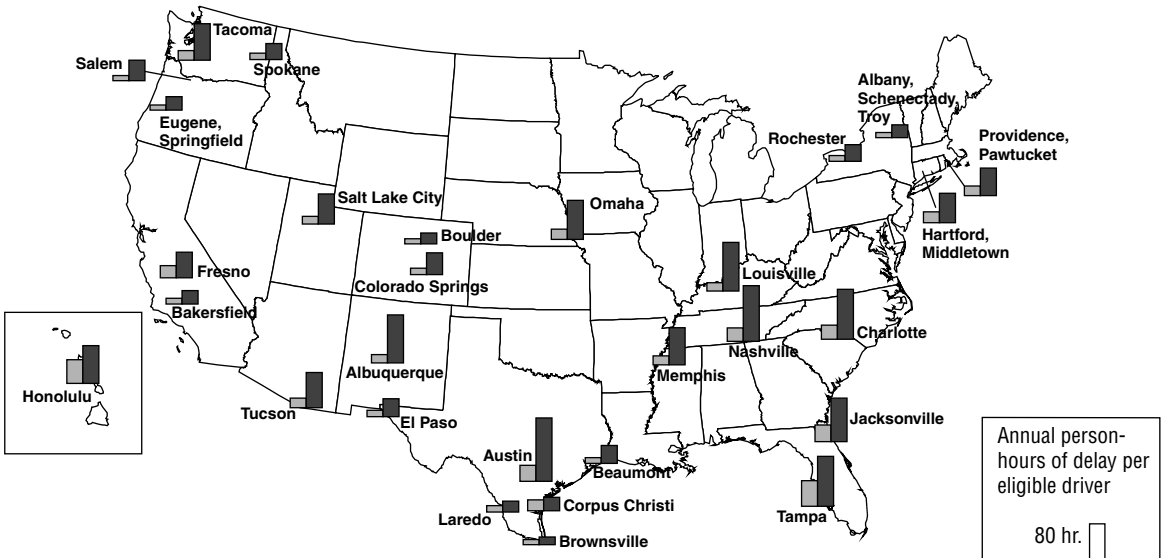


KEY: Very large = over 3 million; Large = over 1 million–3 million; Medium = over 500,000–1 million; Small = 500,000 or less.

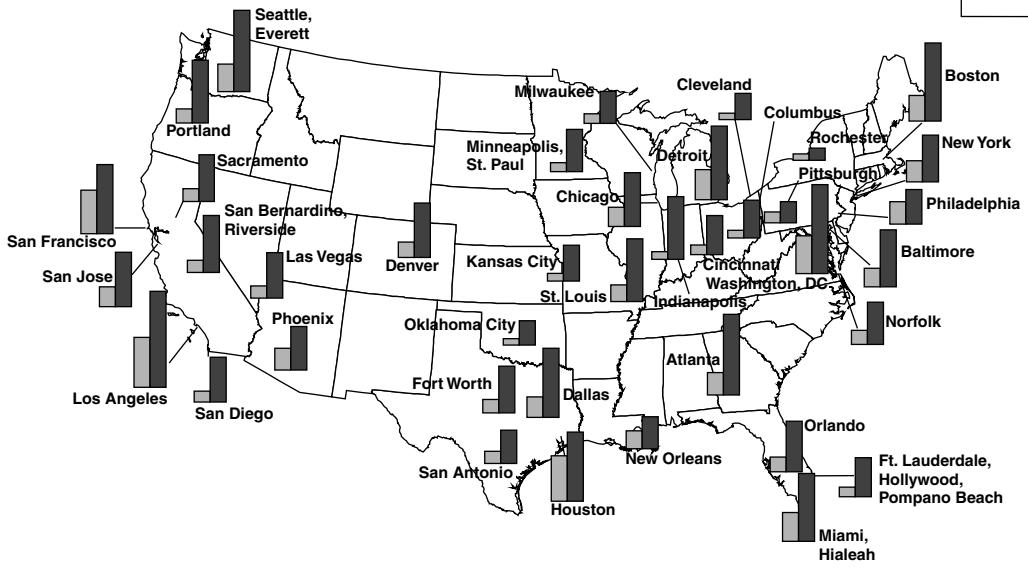
SOURCE: D. Shrank and T. Lomax, *The 1999 Annual Mobility Report: Information for Urban America* (College Station, TX: Texas Transportation Institute, 1999).

Annual Person-Hours of Delay per Eligible Driver: 1982 and 1997

(a) Cities with population under 1 million



(b) Cities with population over 1 million



NOTES: An eligible driver is someone 16 years and older who is eligible for a driver's license. The cities shown represent the 50 largest metropolitan areas, as well as others chosen by the states sponsoring the study. For a detailed explanation of the formulas used, see the source document.

SOURCE: Texas Transportation Institute, *Urban Roadway Congestion Annual Report* (College Station, TX: 1998).

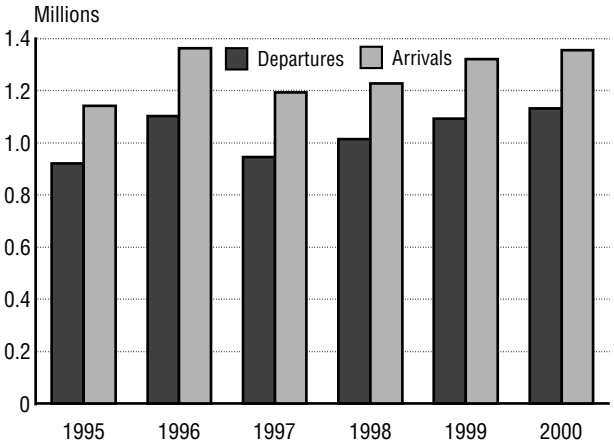
U.S. Airline Delays

Delayed or canceled commercial airline flights cost consumers in many unmeasured ways, including lost personal time, missed meetings, and increased anxiety and stress. Delay also costs the airlines. The Federal Aviation Administration (FAA) estimates that commercial aviation delays cost airlines over $3 billion annually and projects that delays throughout the system will continue to increase as the demand for air travel rises [1]. Both FAA and the airlines consider that improvements in air traffic control should mitigate some flight delay problems. In addition, FAA and the industry are investigating ways to reduce delays attributable to weather, increasing flight volume, and limited system capacity [2].

Both the Bureau of Transportation Statistics (BTS) and FAA track airline delays. According to BTS, a flight is counted as an "on-time departure" if the aircraft leaves the airport gate within 15 minutes of its scheduled departure time, regardless of the time the aircraft actually lifts off from the runway. Also, BTS counts an arriving flight as "on time" if it arrives within 15 minutes of its scheduled gate arrival time [2].

Unlike BTS, which tracks air carrier performance, FAA tracks delays in terms of how well the air traffic control system performs [2]. Tracking begins once a flight is under FAA air traffic control (i.e., after the pilot's request to taxi out to the runway). As such, an aircraft could wait an hour or more at the gate before requesting clearance to taxi. Once under air traffic control, as long as the aircraft took off within 15 minutes of the airport's standard taxi-out time, FAA considers the flight departed on time. [1].

Figure 1
Total Number of Arrival and Departure Flight Delays: 1995–2000

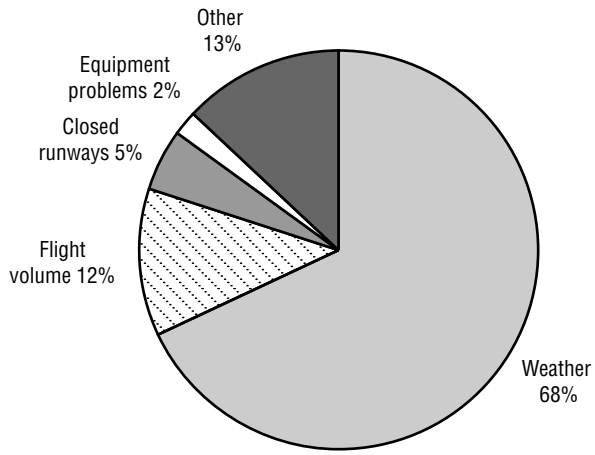


SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information.

Flight delays have increased since 1995, with the greatest number of total delays occurring in 2000 (figure 1). According to BTS data, 1 in 4 flights by major U.S. air carriers were delayed, canceled, or diverted, affecting approximately 163 million passengers in 2000, with delays averaging over 50 minutes per flight. There were nearly 18 percent more BTS-reported arrival delays in 2000 than in 1999 [2].

Most delays take place while the plane is on the ground, although the actual cause of the delay may occur elsewhere. Poor weather is the most common cause for delays (figure 2). The growth in flight volume is also a major contributor to delays and cancellations. Between 1995 and 1999, the total number of operations at the nation's airports

Figure 2
FAA-Cited Causes of Departure and En Route Delays: 1999
(After pushing back from the gate)



SOURCE: U.S. Department of Transportation, Federal Aviation Administration, Operations Network (OPSNET) database.

increased over 8 percent, from approximately 115.6 million to 125.3 million[1] [1].

There is much debate about the role of airline scheduling in causing delays. The "hub and spoke" systems used by the major airlines concentrate flights into the hub airports. The worst delays tend to be at peak travel times during the day and at certain times of the year (e.g., holidays and the summer months) when travel volume is heavier. When heavy volumes are combined with bad weather between a hub airport and its spokes, the ripple effect can cause delays at dozens of other airports [1]. (Table 1 lists the top 10 airports in terms of delays and cancellations.)

In August 2000, the U.S. Department of Transportation created a task force comprising a cross-section of aviation stakeholders, including representatives from airlines, consumer groups, labor unions, and airport operators, to examine the reasons for flight delays and develop recommendations on how to modify airline on-time reporting. Currently, the on-time information that the 10 largest U.S. passenger carriers are required to submit to BTS[2] identifies only the frequency and duration of flight delays and cancellations, not the cause [3]. The Task Force is considering what further steps, including any necessary rulemaking, may be required to collect data on the causes of flight delays [2].

Sources

1. Mead, Kenneth M., Inspector General, U.S. Department of Transportation, "Flight Delays and Cancellations," statement before the Committee on Commerce, Science, and Transportation, United States Senate, Sept. 14, 2000.
2. U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, personal communications, November 2000–April 2001.
3. U.S. Department of Transportation, Office of Public Affairs, press release, Nov. 29, 2000.

[1] Flight operations, as reported by FAA, include takeoffs and landings by all types of aircraft (commercial and general aviation) at approximately 3,400 domestic airports.

[2] In addition to the 10 largest carriers, Aloha Airlines and American Eagle have recently begun voluntarily reporting on-time information to BTS.

Table 1
Top 10 Airports for Percentage of Flights Delayed, Canceled, and Diverted: 2000

Ranking	Airport	Scheduled flights	Actual late departures	Actual late arrivals	Flights diverted away from airport	Canceled	% delayed arrivals	% delayed arrivals, cancellations, and diversions
1	New York-La Guardia	104,177	30,139	44,713	869	7,591	35.1	43.0
2	San Francisco International	135,032	40,481	52,963	393	7,177	33.5	39.2
3	Chicago-O'Hare	296,771	98,362	109,178	830	19,318	29.6	36.8
4	Boston-Logan	113,056	28,595	38,967	237	7,689	27.6	34.5
5	Los Angeles International	212,118	58,937	70,953	359	8,120	29.4	33.4
6	Philadelphia International	121,151	34,791	40,313	681	6,442	27.8	33.3
7	Seattle Tacoma International	104,910	26,907	33,895	219	3,264	29.0	32.3
8	Denver International	137,302	39,659	43,655	186	4,251	28.4	31.8
9	Newark	124,496	29,348	38,292	390	6,330	25.4	30.8
10	Washington-Dulles	65,462	16,744	19,788	193	3,678	24.4	30.2

NOTE: A delay is defined as an aircraft departing from or arriving at a gate more than 15 minutes after its scheduled departure or arrival time.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, 2001.

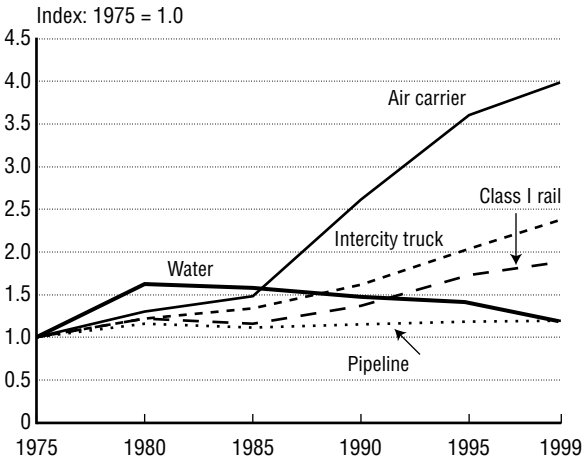
Domestic Freight Shipments

Freight movements grew significantly over the past quarter century despite a general trend in the economy toward services and high-value, low-weight products. Between 1975 and 1999, domestic freight ton-miles increased 67 percent, from 2.3 trillion to over 3.8 trillion, with air carriers and intercity trucking growing faster than the other modes (figure 1). Despite the decline in the maritime mode since 1980, attributable to the decline in Alaskan crude oil shipments, water transportation still accounted for 656 billion ton-miles in 1999.

Population growth and economic activity remain the key factors that determine freight demand; increases in both mean a greater volume of goods produced and consumed and thus more freight moved (figure 2). Between 1975 and 1999, the resident population rose by 57 million, an increase of 26 percent, while the gross domestic product more than doubled from $4 trillion to $8.9 trillion (in inflation-adjusted chained 1996 dollars). The growth in freight ton-miles was slower than the growth in economic activity during this period but outpaced the increase in population.

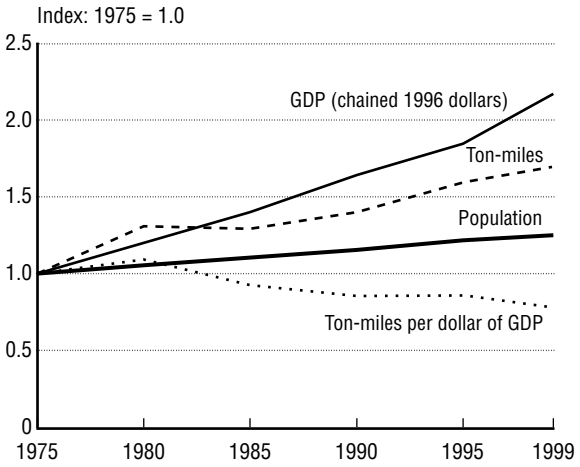
As economic activity expanded, particularly in the 1990s, changes in what, where, and how goods were produced affected freight demand and contributed to the increase in total ton-miles. The composition of goods produced also changed as the economy shifted toward more services and high-value, low-weight products. This shift can be measured by the ratio of ton-miles per dollar of

Figure 1
Growth in Domestic Freight Ton-Miles



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2000* (Washington, DC: 2001).

Figure 2
Domestic Ton-Miles, Gross Domestic Product, and Resident Population



KEY: GDP = Gross Domestic Product.

SOURCE: GDP data—U.S. Department of Commerce, Bureau of Economic Analysis, available at www.bea.doc.gov/bea/dn/gdplev.htm, as of Apr. 20, 2001. Ton-miles data—U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics 2000* (Washington, DC: 2001). Population data—U.S. Department of Commerce, U.S. Census Bureau, available at www.census.gov/population/estimates/nation/popclockest.txt, as of Apr. 20, 2001.

Gross Domestic Product (GDP), which has declined since 1975. This decline suggests that, as the economy becomes more service-based, fewer ton-miles of freight are used to produce a dollar of GDP, making the economy less freight-intensive. It takes more freight ton-miles to produce $1,000 worth of steel than it does to produce $1,000 worth of cellular phones. Today, even traditional products like automobiles are made from lighter, but often more expensive, materials such as engineered plastics.

As economic growth has accelerated, disposable personal income per capita has increased and individual purchasing power risen. Businesses have responded by shipping more freight per resident population. Freight ton-miles per capita rose more than 30 percent, from about 10,600 in 1975 to 14,000 in 1999.

The manufacture, assembly, and distribution of goods continue to change as components of products are produced in facilities located thousands of miles apart, some halfway around the globe. Today, many businesses manage worldwide production and distribution systems, increasing global trade in goods and the demand for freight transportation. Changes in where goods are produced can directly increase total ton-miles and change the average length of haul of shipments. Such changes also affect freight mode choice, with more commodities being shipped by multiple modes as distances increase. This worldwide spatial distribution of production activities and trade impacts transportation requirements in the United States. For example, expanding trade with the Pacific Rim continues to make West Coast container ports more dominant than East Coast ports and poses challenging landside and intermodal access demands.

Air Carrier Freight

Domestic air freight grew much faster than the other transportation modes between 1993 and 1997, whether measured by value, tons, or ton-miles. The value increased 52 percent during this period, from $151 billion to $229 billion in 1997 dollars (table 1), tons carried rose 43 percent, and ton-miles grew by 56 percent. Some shipments using parcel, postal, and courier services are transported via air. Between 1993 and 1997, this type of service, employing multiple modes, grew 40 percent from $613 billion in 1993 to $856 billion in 1997, making it the second fastest growing freight service when measured by value. These Commodity Flow Survey (CFS) estimates cover the most recent years for which comprehensive freight flow data are available.

Air carriers and courier services provide businesses the means to move high-value goods to markets and consumers fast and effectively over long distances. In 1997, the value of goods moved by air carriers averaged over $51,000 per ton, up slightly from $48,000 a ton in 1993 (both in 1997 dollars). Goods moved by parcel, postal, and courier services averaged $36,000 per ton, up from $32,000 per ton in 1993. For other freight modes, the value-to-weight ratio was less than $1,000 per ton in 1993 and 1997 [1].

Categories of commodities[1] of freight shipments can be ranked by value, value per ton, and average miles per ton. Aircraft, spacecraft, and parts ranked the highest in value and value per ton for shipments by air carriers (table 2). Dairy products ranked highest in miles per ton. Similarly, electronic components and parts ranked second in value and value per ton, while footwear was the second in miles per ton. For commodities moved by parcel, postal and courier services, the highest ranked by value was miscellaneous manufactured products (table 3). Electronic components and parts ranked first in value and fresh-cut flowers ranked first in miles per ton.

In 1997, air carriers moved high-value commodities over longer distances than the other freight modes. On average, the top 10 commodities shipped by air, measured by value per ton, were moved over 1,200 miles per ton. Air carriers also moved other commodities over great distances. For example, the three commodities ranked highest by average miles per ton were: dairy products (3,000 miles); footwear (2,500

Table 1
Value of Commodities Shipped in the United States by Mode of Transportation: 1993 and 1997
(Commodity Flow Survey data only)

Mode	1993 (billions of 1997 dollars)	1997 (billions of 1997 dollars)	1993–1997 % change
All modes	**6,335**	**6,944**	**10**
Air (includes truck and air)	151	229	52
Parcel, postal, and courier	610	856	40
Rail	268	320	19
Pipeline	97	114	17
Water	67	76	14
Truck	4,772	4,982	4
Truck and rail	90	76	–16
Truck and water	10	8	–19
Rail and water	4	2	–54
Other and unknown modes	266	283	6

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 1993 and 1997 Commodity Flow Surveys.

[1] The commodities are based on the three-digit Standard Classification of Transported Goods (SCTG) coding system. The three-digit SCTG commodity data are not available for 1993 to allow comparison.

Table 2
U.S. Freight Shipments by Air Carriers: 1997
(Including truck and air)

SCTG code	Ranking	Measure
	Value	**Value ($millions)**
	All commodities by air carriers	*229,062*
372	Aircraft and spacecraft	55,394
358	Electronic components and parts	32,704
355	Computer and office equipment	27,021
409	Miscellaneous manufactured products	14,962
359	Other electronic and electrical equipment	11,726
210	Pharmaceutical products	10,524
384	Medical instruments, apparatus, and appliances	7,846
353	Line telephone or telegraph apparatus	6,923
357	Transmission apparatus for radio and television	5,603
349	Other machinery	5,213
	Value per ton	**Dollars per ton**
	All commodities by air carriers	*51,187*
372	Aircraft and spacecraft	728,868
358	Electronic components and parts	480,941
342	Turbines, boilers, nuclear reactors, and nonelectric engines	327,077
384	Medieval instruments, apparatus, and appliances	245,188
357	Transmission apparatus for radio and television	233,458
385	Meters and other instruments and apparatus	153,970
210	Pharmaceutical products	148,225
355	Computer and office equipment	120,629
381	Optical elements, instruments, and apparatus	116,267
409	Miscellaneous manufactured products	108,420
	Average miles per ton	**Miles per ton**
	All commodities by air carriers	*1,393*
071	Dairy products, except beverages	3,200
304	Footwear	2,500
264	Windows, doors, frames, and builders joinery	2,333
241	Plastics and rubber in primary forms and sheets	1,889
239	Other chemical products and preparations	1,857
243	Rubber articles	1,750
385	Meters and other instruments and apparatus	1,727
302	Textile clothing and accessories, and headgear	1,701
357	Transmission apparatus for radio or television	1,667
324	Nonferrous metal, except precious	1,643

KEY: SCTG = Standard Classification of Transported Goods.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 1997 Commodity Flow Survey.

Table 3
U.S. Freight Shipments by Parcel, Postal, and Courier Services: 1997

SCTG code	Ranking	Measure
	Value	**Value ($millions)**
	All commodities by parcel, postal, courier services	*855,897*
409	Miscellaneous manufactured products	91,403
355	Computer and office equipment	74,539
210	Pharmaceutical products	73,149
358	Electronic components and parts	65,525
359	Other electronic and electrical equipment	47,226
302	Textile clothing and accessories, and headgear	41,310
291	Printed books, brochures, and similar printed products	35,429
349	Other machinery	35,237
384	Medical instruments, apparatus, and appliances	31,519
333	Handtools, cutlery, and machine tools	26,156
	Value per ton	**Dollars per ton**
	All commodities by parcel, postal, courier services	*36,131*
358	Electronic components and parts	275,315
372	Aircraft and spacecraft	269,094
357	Transmission apparatus for radio or television	194,627
381	Optical elements, instruments, and apparatus	151,886
385	Meters and other instruments and apparatus	145,898
342	Turbines, boilers, nuclear reactors, and nonelectric engines	127,000
383	Surveying and navigational instruments and appliances	121,500
384	Medical instruments, apparatus, and appliances	118,492
356	Prepared unrecorded or prerecorded media	93,727
355	Computer and office equipment	91,684
	Average miles per ton	**Miles per ton**
	All commodities by parcel, postal, courier services	*760*
039	Fresh-cut flowers, plants, and parts of plants	1,458
293	Advertising material, commercial and trade catalogues	1,164
304	Footwear	1,144
033	Fresh, chilled, or dried edible fruit and nuts	1,133
372	Aircraft and spacecraft	1,132
402	Toys, games, and sporting equipment	1,096
383	Surveying and navigational instruments and appliances	1,083
354	Electronic entertainment products, except parts	1,080
090	Tobacco products	1,042
192	Refined petroleum oils and bituminous minerals oils	1,000

KEY: SCTG = Standard Classification of Transported Goods.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 1997 Commodity Flow Survey.

miles); and windows, doors, frames, and builders joinery products (2,300 miles) [1].

In the miles per ton category, the top 10 commodities shipped by parcel, postal, and courier services were moved over 900 miles per ton. The three commodities that traveled the longest distance and ranked the highest by average miles per ton were fresh-cut flowers and plants (1,460 miles); advertising materials, commercial and trade catalogues (1,160 miles); and footwear (1.140 miles) [1].

Source

1. U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 1993 and 1997 Commodity Flow Surveys.

U.S. Container Trade

World container trade increased overall throughout the 1990s, despite the Asian economic crisis in 1998. In 1999, world container trade grew approximately 9 percent above the 1998 level (table 1). The United States ranked first in world container traffic until 1998, when China moved to the number one position [1].

In general, demand for U.S. exports has not kept pace with U.S. consumer demand for imports. Accordingly, the balance of international container trade (i.e., the volume of U.S. containerized exports compared with containerized imports) has shifted in favor of U.S. imports, particularly in recent years. Between 1993 and 1997, the balance of U.S. international container trade was less than 1 million 20-foot equivalent units (TEUs) per year (figure 1). By 1999, this gap had widened to a difference of 4 million TEUs. At the Port of New York and New Jersey, for example, containerized imports rose 12.9 percent in 1999 while exports fell 4.5 percent, resulting in 402,000 excess TEUs [4]. U.S. imports from Asia are twice the volume of U.S. exports to that region [2].

A major component of operating costs for this segment of the shipping industry is the positioning of containers at strategic points along trade lanes. Containers cost to move whether empty or full. If an outbound trade lane is strong and the inbound side is not as robust, full containers are exported but cargo may be nonexistent for a profitable return trip. In some trade lanes, such as the Transpacific, carriers may be able to add repositioning charges to shipping rates. In other, less competitive trade lanes, carriers may not have this option. To offset repositioning costs, containers are stacked up at ports or intermodal and other facilities.

Table 1
U.S. and World Container Traffic: 1994–1999
(Millions of TEUs)

Year	World	United States	U.S. rank
1994	128.3	18.4	1
1995	137.2	19.1	1
1996	150.8	21.8	1
1997	160.7	21.8	1
1998	169.6	24.2	2
1999	184.6	26.1	2

KEY: TEUs = 20-foot equivalent units.

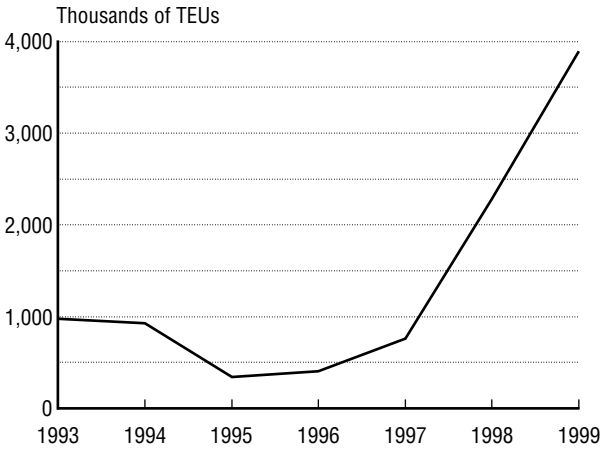
NOTE: Numbers have been revised for each annual publication.

SOURCE: Jane Degerlund et al., *Containerisation International Yearbook* (London, England: Informa Group, Inc., Various years, 1997–2001).

The repositioning or storage of millions of containers in the United States could increase the operating costs of the maritime industry and the intermodal transportation industry, as a whole. Although some ports, such as Los Angeles and Long Beach, have been able to secure additional container terminal space, other ports are finding that they have to stack containers higher and higher [3]. This is particularly true for import-intensive ports. In some areas, extensive storage of used containers can become not only a local land-use issue, but may also eventually lead to environmental problems.

(continued on next page)

Figure 1
Balance of U.S. International Container Trade—Net Imports: 1993–1999



KEY: TEUs = 20-foot equivalent container units.

SOURCE: *The Journal of Commerce,* Port Import/Export Reporting Service (PIERS) data, various years.

Sources

1. Degerlund, Jane et al., *Containerisation International 2001* (London, England: Informa Group, Inc., 2001), p. 8.
2. Journal of Commerce, "Special Report: Container Shipping, Sacrificing Export Rates," *JOC Week,* vol. 1, No. 28, Dec. 11–17, 2000, p. 28.
3. ____. "Ports Forced to Stack Containers," *Special Report: Intermodal Expo,* Apr. 11, 2000.
4. Port Authority of New York and New Jersey, "Cargo Continues Strong Gains in Port of NY/NJ," press release, Oct. 17, 2000.

U.S. Commercial Freight Activity

The U.S. transportation system moved 3.9 trillion ton-miles of commercial freight in 1997, weighing 15 billion tons and valued at $8.6 trillion (table 1). On an average day, approximately 41 million tons of commodities valued at over $23 billion moved nearly 11,000 miles on the nation's transportation system. This represents an average daily freight flow of 310 pounds moving 40 miles per U.S. resident.

These recently revised Bureau of Transportation Statistics (BTS) total estimates are based on 1997 Commodity Flow Survey (CFS) data (see box) and supplemental estimates prepared for BTS by Oak Ridge National Laboratory. The 1997 CFS covered about 81 percent of the value, 75 percent of the tonnage, and nearly 70 percent of the ton-miles of all the commercial freight moved within the United States. The supplemental estimates cover shipments that were out-of-scope of the CFS and include farm-to-processing plant shipments, surface transportation imports from Canada and Mexico, air cargo imports and exports, and maritime imports and exports.

There are significant differences between the CFS and the supplemental data, especially in how the commodity mix, modal combinations, and average shipment distances are presented. For example, CFS shipments were valued at $626 per ton compared with $437 per ton for supplemental freight flow data, which better covers crude oil and petroleum products. Because imports and exports usually move longer distances than domestic shipments, the average

The Commodity Flow Survey

Most of the national estimates of freight movement presented in this report are based on results from the 1997 Commodity Flow Survey (CFS), conducted by the Bureau of Transportation Statistics (BTS) and the Census Bureau, and additional estimates of freight shipments that are not fully measured in the CFS. Conducted for the first time in 1993 and again in 1997, the CFS is the nation's primary and most comprehensive data source on domestic freight movement. It surveys a sample of shipments by domestic establishments engaged in manufacturing, mining, wholesale trade, and some selected retail trade services. The CFS collects information about what modes these establishments used to ship their products and materials, the types of commodities they shipped, and the value, weight, distance, origin, and destination of the shipments. The survey collects information on freight moved by each mode of transportation and on freight moved by intermodal combinations (e.g., truck and train).

Table 1
U.S. Commercial Freight Shipment Totals: 1997

Source	Value (1997 $billion)	Tons (millions)	Ton-miles (billions)	Percent			Value per ton (dollars)	Miles per ton
				Value	Tons	Ton-miles		
Commodity Flow Survey	6,944	11,090	2,661	81.1	74.9	69.1	626	240
Supplemental estimates[1]	1,623	3,710	1,190	18.9	25.1	30.9	437	321
Total	**8,567**	**14,800**	**3,851**	**100.0**	**100.0**	**100.0**	**579**	**260**

[1] Based on additional estimates prepared for the Bureau of Transportation Statistics by Oak Ridge National Laboratory. The estimates cover out-of-scope farm-based truck shipments, truck imports from Canada and Mexico, rail imports from Canada and Mexico, air cargo imports and exports, and water imports and exports. The estimates exclude noncommercial freight shipments such as government shipments and municipal solid waste.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, *1997 Commodity Flow Survey, United States,* EC97TCF-US (Washington, DC: 1999); and Oak Ridge National Laboratory data.

ton-miles per ton was higher for the supplemental flows (321 miles per ton) than for the CFS flows (240 miles per ton).

Modal shares of freight shipments have also been estimated using the combined 1997 CFS and supplemental data. When measured by value of shipments or by tons, trucks moved the majority of total U.S. commercial freight (table 2 and figure 1). In 1997, trucking (both for-hire and private) transported about 62 percent of the value and nearly 60 percent of the tonnage. When shipments are measured by ton-miles, rail slightly edged out trucking. Intermodal combinations[1] moved 11 percent of the shipments by value and accounted for over 5 percent of the ton-miles.

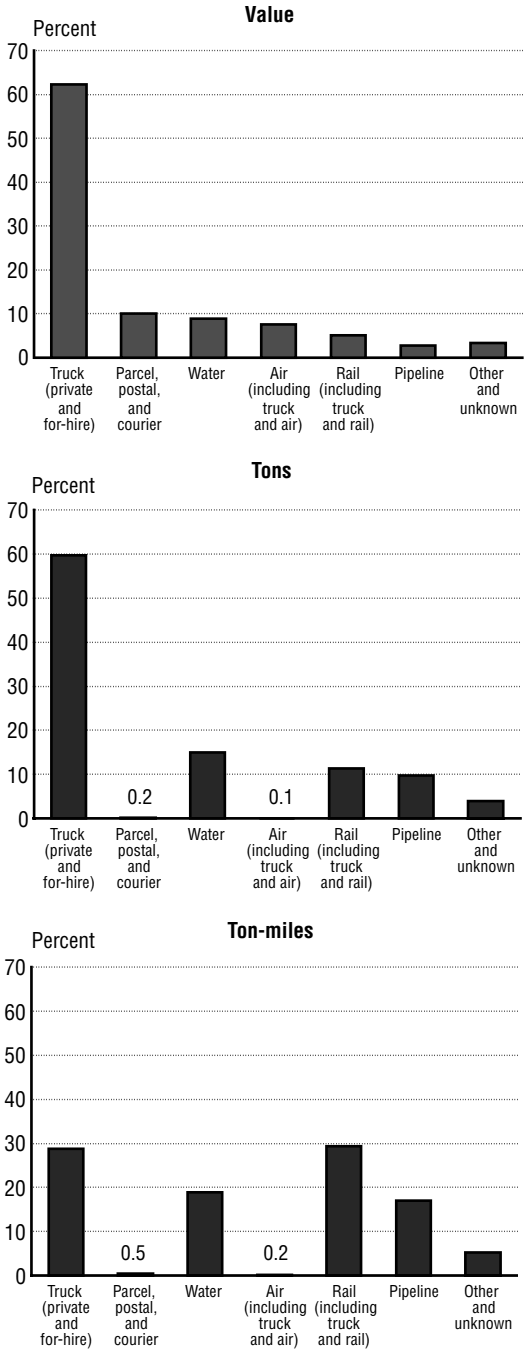
[1] Intermodal combinations include parcel, postal, and courier services; truck and rail, truck and water; and rail and water. Truck and air are excluded, but have been added to air transportation.

Table 2
U.S. Commercial Freight Shipments by Value, Tons, and Ton-Miles: 1997

Mode	Value (1997 $billions)	Tons (millions)	Ton-miles (billions)
Truck (private and for-hire)	5,336	8,836	1,109
Parcel, postal, and courier	856	34	18
Water	762	2,220	726
Air (including truck and air)	653	10	6
Rail (including truck and rail)	436	1,676	1,132
Pipeline	231	1,448	656
Other and unknown	293	576	204
Total	8,567	14,800	3,851

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, *1997 Commodity Flow Survey, United States,* EC97TCF-US (Washington, DC: 1999); and Oak Ridge National Laboratory data.

Figure 1
Modal Shares of U.S. Commercial Freight Shipments by Value, Tons, and Ton-Miles: 1997



SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, *1997 Commodity Flow Survey, United States,* EC97TCF-US (Washington, DC: 1999); and Oak Ridge National Laboratory data.

Major Commodity Shipments in the United States

Over 800,000 businesses shipped nearly $7 trillion worth of products via the nation's highways, railroads, waterways, pipelines, and aviation system in 1997. This reflects about a 10 percent increase from 1993 (in real terms)[1] [1].

Motor vehicle parts and accessories[2] accounted for the highest dollar value ($272 billion) of the shipments, followed by miscellaneous manufactured products, computer equipment, mixed freight, and pharmaceutical products (table 1). All of the 10 major commodities measured by value are high value per weight, except gasoline. They accounted for 30 percent of the total value of shipments but only 10 percent of the ton-miles. Reflecting in part the importance of high technology, information, and communications, businesses shipped $536 billion worth of computer equipment, electrical and office equipment, and electronic parts. This represents almost 8 percent of the $6,944 billion worth of shipments made in 1997.

As can be expected, high-weight bulk products topped the list of shipments measured in tons. The top commodity was bituminous coal, at 1.1 billion tons or 10 percent of the total tons shipped. Coal was followed by gravel and crushed stones, gasoline, limestone and chalk, and fuel oils. The 10 major commodities measured by tonnage have an enormous impact on the nation's transportation system, accounting for just over half (51 percent) of the total 11 billion tons and nearly 38 percent of the 2,661 billion ton-miles moved in 1997. Bulk commodity shipments impact both local and long-haul transportation. Five out of the 10 major commodities were shipped between 106 miles and 484 miles per ton [1].

When measured by ton-miles, the 10 major commodities accounted for over 41 percent of the total. Bituminous coal, by far the most dominant U.S. bulk commodity and often shipped long distances and nationwide, accounted for the largest share (20 percent) and generated 540 billion ton-miles. Ranked after coal were corn (except sweet corn), gasoline, limestone, and fuel oils, but these four commodities totaled only 12.9 percent of the ton-miles. In 1997, each ton of bituminous coal was moved, on average, 484 miles. Iron ores and concentrates, at only 41 billion ton-miles, are moved an average of 617 miles per ton [1].

[1] These data, from the Commodity Flow Survey, cover about 75 percent of the total tonnage of domestic freight shipments but do not cover all shipments of commodities such as crude petroleum.

[2] Based on the four-digit Standard Classification of Transported Goods coding system.

Source

1. U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 1993 and 1997 Commodity Flow Surveys.

Table 1
Major Commodities Shipped in the United States: 1997
(Commodity Flow Survey data only)

SCTG code	Four-digit commodity groups	Value ($billions)	Tons (millions)	Ton-miles (billions)	Value per ton	Miles per ton
	All commodities	**6,944**	**11,090**	**2,661**	**626**	**240**
	Ranked by value					
3640	Parts and accessories for motor vehicles, except motorcycles	272	55	22	4,937	393
4099	Miscellaneous manufactured products, n.e.c.	267	97	33	2,765	338
3551	Computer equipment	233	4	3	63,149	895
4399	Mixed freight	230	110	17	2,090	156
2100	Pharmaceutical products	224	10	6	22,678	564
1710	Gasoline	204	858	110	237	128
3610	Motor vehicles for the transport of less than 10 people, except motorcycles	193	24	15	8,005	623
3020	Textile clothing and accessories, and headgear	186	10	6	19,091	640
3599	Electrical, electronic, and office equipment	158	14	7	11,519	546
3581	Electronic parts	145	1	1	150,640	926
	Ranked by tons					
1510	Nonagglomerated bituminous coal	24	1,114	540	21	484
1202	Gravel and crushed stone, except dolomite, slate, and limestone	7	994	41	7	41
1710	Gasoline	204	858	110	237	128
1201	Limestone and chalk (calcium carbonate)	5	821	52	6	64
1800	Fuel oils	94	482	51	196	106
1101	Silica sands and quartz sands, for construction use	2	332	14	6	44
3194	Nonrefractory mortars and concretes	11	318	7	34	22
0220	Corn, except sweet	31	305	130	103	426
3195	Articles of cement, concrete, or artificial stone	17	281	16	60	56
3220	Flat-rolled products of iron or steel	92	181	48	510	264
	Ranked by ton-miles					
1510	Nonagglomerated bituminous coal	24	1,114	540	21	484
0220	Corn, except sweet	31	305	130	103	426
1710	Gasoline	204	858	110	237	128
1201	Limestone and chalk (calcium carbonate)	5	821	52	6	64
1800	Fuel oils	94	482	51	196	106
3220	Flat-rolled products of iron or steel	92	181	48	510	264
0210	Wheat	17	124	45	134	360
2050	Organic chemicals, n.e.c.	84	85	44	996	514
0340	Soya beans	28	111	43	250	383
1410	Iron ores and concentrates	2	66	41	34	617

KEY: n.e.c. = not elsewhere classified; SCTG = Standard Classification of Transported Goods.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 1997 Commodity Flow Survey.

Classes of Hazardous Materials Shipped

Shipment of hazardous materials, such as gasoline, fuel oil and other petroleum products, chemicals, and corrosives, are ubiquitous on our nation's highways, rail network, waterways, and by pipelines. The latest Commodity Flow Survey (CFS), conducted by the Bureau of Transportation Statistics and the Census Bureau, shows that hazardous materials account for about 14 percent of the tonnage moved. Flammable liquids exceed all other hazard classes in exposure on the U.S. transportation system, accounting for more than 80 percent of total tons (table 1). The highway, pipeline, and water modes move the largest volume of flammable liquids. Unfortunately, the CFS was unable to capture pipeline ton-miles data because shippers cannot assess the distance material moves once it enters the pipeline network and becomes interchangeable with products already being transported.

The U.S. transportation system moved more than 1.5 billion tons of hazardous materials in 1997, valued at $466 billion [1, 2]. In terms of tons, trucks moved the greatest percentage of hazardous materials, followed by the pipeline, water, rail, and other modes, which include air, parcel, postal, and multiple modes (figure 1).

Table 1
Hazardous Materials Shipments by Class and Tonnage: 1997

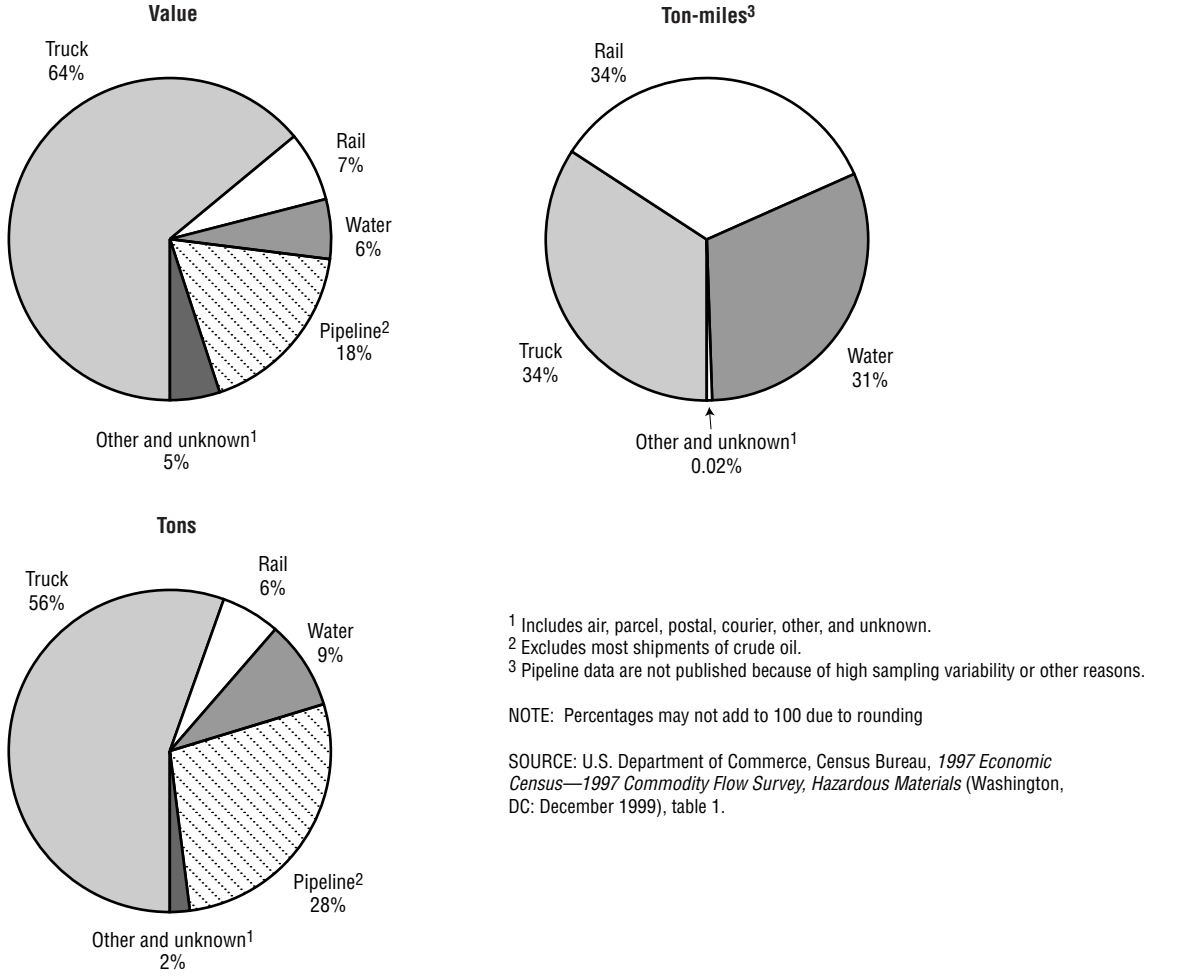
Class	Total tonnage (thousands)
Flammable liquids	1,264,281
Gases	115,021
Corrosive materials	91,564
Flammable solids	11,804
Oxidizers/organic peroxides	9,239
Poisons	6,366
Explosives	1,517
Radioactive materials	87
Miscellaneous dangerous goods	65,317
Total	**1,565,196**

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics; and U.S. Department of Commerce, Census Bureau, *1997 Economic Census, Transportation—Commodity Flow Survey* (Washington, DC: Apr. 20, 2000), table 6a.

Sources

1. U.S. Department of Commerce, Census Bureau, *1997 Economic Census—Transportation, 1997 Commodity Flow Survey* (Washington, DC: December 1999).
2. U.S. Department of Transportation, Bureau of Transportation Statistics, 2000.

Figure 1
Hazardous Materials Shipments by Mode of Transportation: 1997



1 Includes air, parcel, postal, courier, other, and unknown.
2 Excludes most shipments of crude oil.
3 Pipeline data are not published because of high sampling variability or other reasons.

NOTE: Percentages may not add to 100 due to rounding

SOURCE: U.S. Department of Commerce, Census Bureau, *1997 Economic Census—1997 Commodity Flow Survey, Hazardous Materials* (Washington, DC: December 1999), table 1.

Intermodal Freight Shipments

The U.S. transportation system, responding to domestic economic growth, global competition, technological advances in information and production technologies, and changing supply chain requirements, has become increasingly intermodal.[1] The ability to shift goods between multiple modes in a timely, cost-effective, reliable manner (primarily through containers) is now essential for a high performing system and plays a key role in U.S. shippers' choice of mode or modes. Growth in the global market for high-value, time-sensitive goods has increased the demand for intermodal freight shipments.

Intermodal freight is increasing at a faster rate than freight moved by single modes.[2] In 1997, intermodal shipments accounted for 2 percent of the tonnage, 8 percent of the ton-miles, and about 17 percent of the value of commercial freight shipments in the United States. The value of intermodal freight, measured by the Commodity Flow Survey, rose from $872 billion in 1993 to $1,175 billion in 1997 (both in 1997 dollars), a 35 percent increase. In comparison, the value of single-mode freight shipments increased from $5,376 billion to $5,720 billion, an increase of 6.4 percent.

The magnitude of intermodal shipments varies by state. Many factors affect the size of intermodal freight transported in each state, including the size of the state's economy and population, its transportation infrastructure, and whether it is a gateway for international trade. The map on the next page illustrates the importance of intermodal shipments relative to total shipments in each state. A high proportion of freight originating in New York and Florida, for example, is intermodal. In comparison, a small proportion of freight shipped from Wyoming is intermodal because it is dominated by coal that moves primarily by rail.

Although intermodal shipments account for a relatively small proportion of freight tonnage and ton-miles, they play a key role in business logistics and in international trade. The rapid growth in this type of shipment presents capacity and congestion challenges to the freight community and increases the need to improve the efficiency of intermodal connections at marine and air cargo facilities, land border crossings, intermodal rail terminals, and domestic access infrastructure. The growth of containerization has made intermodal shipments—both domestic and international—more timely, cost-effective, and reliable.

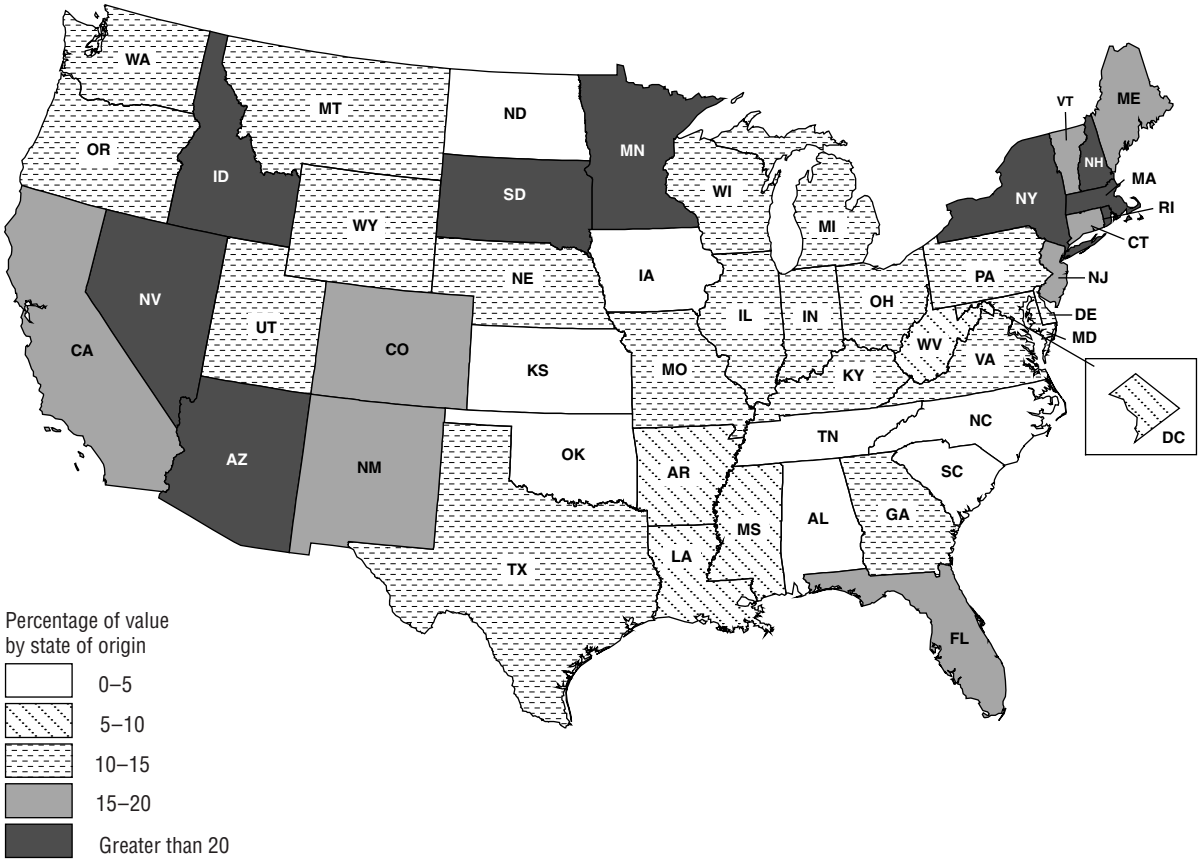
Source

1. U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, *1997 Economic Census: Transportation, 1997 Commodity Flow Survey* (Washington, DC: 1999), table 7.

[1] Intermodal freight as defined in the Commodity Flow Survey includes all shipments using two or more modes: air transportation (including truck and air); truck and rail; truck and water; rail and water; parcel, postal, and courier services; and other intermodal combinations.

[2] The Commodity Flow Survey underestimates truck and rail intermodal movement because imports are not included. Railroads handle millions of containers that arrive by ship and are trucked to nearby railyards for delivery by rail.

Intermodal Shipments as a Percentage of Total Shipments by State: 1997
(Commodity Flow Survey data only)



SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, Commodity Flow Survey data.

Major Commodity Shipments by the Trucking Industry

Trucking (for-hire and private) moved more freight in the United States in 1997 than any other mode, when measured by the value and tonnage of commodities. It was the dominant mode not only for commercial freight shipments as a whole, but also for the major commodity groups (table 1). For single mode shipments, Commodity Flow Survey (CFS) data show that trucking accounted for 71.7 percent of the value in 1997, down slightly from 75.3 percent in 1993. By tonnage, truck shipments accounted for 69.4 percent in 1997, up from 65.9 percent in 1993. However, when measured in ton-miles, trucking only accounted for 38.5 percent of the CFS shipments in 1997, a slight increase from 35.9 percent in 1993, reflecting the heavy use of this mode for local shipping.

Among the top 10 commodities by value, trucking's market share ranged from 56 percent to 92 percent. Electronic, electrical equipment, and office equipment was the largest commodity group in 1997 and trucking accounted for 56 percent of these shipments. Trucking also moved a large percentage of shipments for the majority of the next largest commodity groups: motorized and other vehicles (64 percent) and miscellaneous manufactured products (64 percent). Two in the top 10 commodity group—electronic, electrical equipment, and office equipment and miscellaneous manufactured products—have the fastest growing freight markets. Between 1993 and 1997, the value of electronic, electrical equipment, and office equipment shipments rose by 56 percent, from $558 billion to $870 billion (1997 dollars). Miscellaneous manufactured products shipped in the United States increased from $252 billion to $420 billion, a 67 percent rise.

On average, each ton of electronic, electrical equipment, and office equipment shipped by truck in 1997 was carried an average of 650 miles and was valued at about $15,000 per ton. In contrast, a ton of miscellaneous manufactured products traveled about 300 miles and was valued at $2,600.

When measured by weight, trucks dominate shipments of 8 of the top 10 commodity groupings, with rail moving about 57 percent of coal and competing for 29 percent of cereal grains. In ton-miles, however, trucks moved only about 2 percent of coal (rail, 81 percent) and 9 percent of cereal grain (rail, 58 percent).

Source

1. U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, *1997 Economic Census: Transportation, 1997 Commodity Flow Survey* (Washington, DC: 1999), table 7.

Table 1
Trucking and Railroad Share of the Major Commodity Shipments in the United States: 1997
(Commodity Flow Survey Data Only)

SCTG code	Top 10 commodity groupings	All modes	Trucking	Rail	Trucking share (%)	Rail share (%)
	By value ($billions)					
	All commodities	*6,944*	*4,982*	*320*	*71.7*	*4.6*
35	Electronic, electrical equipment, and office equipment	870	484	3	55.7	0.3
36	Motorized and other vehicles (including parts)	571	367	77	64.2	13.5
40	Miscellaneous manufactured products	421	268	3	63.7	0.6
34	Machinery	417	320	6	76.7	1.5
30	Textiles, leather, and articles of textiles or leather	379	293	0.47	77.4	0.1
7	Other prepared foodstuffs and fats and oils	346	319	13	92.2	3.8
32	Base metal in primary or semifinished forms	286	242	26	84.7	9.1
24	Plastics and rubber	279	219	21	78.5	7.6
29	Printed products	260	178	0.27	68.4	0.1
41	Mixed freight	230	219	–	95.0	–
	By tonnage (millions)					
	All commodities	*11,090*	*7,701*	*1,550*	*69.4*	*14.0*
12	Gravel and crushed stone	1,815	1,672	51	92.1	2.8
15	Coal	1,217	217	687	17.8	56.5
17	Gasoline and aviation turbine fuel	963	518	5	53.8	0.6
31	Nonmetallic mineral products	910	860	23	94.5	2.5
2	Cereal grains	490	189	142	38.5	29.1
18	Fuel oils	482	244	7	50.7	1.4
19	Coal and petroleum products, n.e.c.	475	281	62	59.2	13.0
11	Natural sands	443	413	11	93.4	2.5
7	Other prepared foodstuffs and fats and oils	397	348	32	87.6	8.1
25	Logs and other wood in the rough	371	349	7	94.0	2.0
	By ton-miles (billions)					
	All commodities	*2,661*	*1,024*	*1,023*	*38.5*	*38.4*
15	Coal	542	9	439	1.7	81.0
2	Cereal grains	201	18	116	9.1	58.0
20	Basic chemicals	137	34	69	24.7	50.8
17	Gasoline and aviation turbine fuel	137	29	3	21.5	2.1
7	Other prepared foodstuffs and fats and oils	124	79	34	63.5	27.0
32	Base metal in primary or semifinished forms	117	68	36	57.5	30.9
26	Wood products	97	52	36	53.9	36.7
12	Gravel and crushed stone	93	58	11	62.8	11.8
31	Nonmetallic mineral products	91	64	14	69.7	15.4
27	Pulp, newsprint, paper, and paperboard	84	44	35	52.3	42.3

NOTE: – = data do not meet publication standards because of sampling variability or other reasons; n.e.c. = not elsewhere classified; SCTG = Standard Classification of Transported Goods.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, *1997 Commodity Flow Survey, United States,* EC97TCF-US (Washington, DC: 1999).